• **Adequate profit margins** never meant more to the coal industry than at present, and timely Coal Age—with the 19th Annual Model Mining Issue next month—again contributes a plethora of up-to-the-minute operating data on the best practices of an entire producing field. "Low-Cost and How to Get It" is the theme of the December number, written in and about the modernized mines of northern West Virginia.

• **We are neutral.** We don't like war booms. But facts are facts. Coming at the close of a year first marked by an unexpected cessation of operations, followed by rising demand plus attempts to rebuild depleted stocks, and now facing the unknown possibilities of greater export trade, coal must take a look at what happened before in order to even come close to a "guesstimate" of the future. See p. 45.

• **Canada** comes in for a full measure of additional Coal Age treatment in forthcoming issues, as our much-traveled engineering editor, R. Dawson Hall, is just completing a wide swing through the western provinces and brings back some interesting stories from those producing sections. (Incidentally, R.D.H. slipped in a visit on the side to the San Francisco Fair, though we doubt the discovery of more than bunker coal and its problems on the trek to that seaport.)

• **Changing** power-distribution methods, brought about by mechanical-loader demand for sufficient and flexible supply at the face, gave the final impetus to development and perfection of mercury-arc rectifiers for coal-mine use. The fact that number and capacity of these units installed in the past three years exceeds other type conversion machinery indicates conclusively their place in the scheme of ultra-modern coal-mine equipment. D. E. Renshaw traces Ignitron history and practice, p. 49.

• **Anthracite's** modernizing programs again claim the limelight with Lehigh Valley Coal Co. improving shaft-bottom conditions to quadruple output at Hazleton; p. 54. Automatic cagers, car feeders, trip makers and sufficient trackage have converted a 1,200-ton mine into one producing 4,500 tons per day, to fully justify the heavy expenditure. How this same shaft was deepened by sinking and raising will also be detailed in an early issue.

• **Mine foremen** have the responsibility of solving a thousand and one daily problems which make or mar the record of the mine for safety and efficiency. A primary detail is ventilation, with its constantly changing pressures and resistances, calling for continual checking for quality and quantity. How a foreman can improve ventilation is told on p. 52, in the first of a series of articles written expressly for those who can and do clip underground costs by attention to detail.

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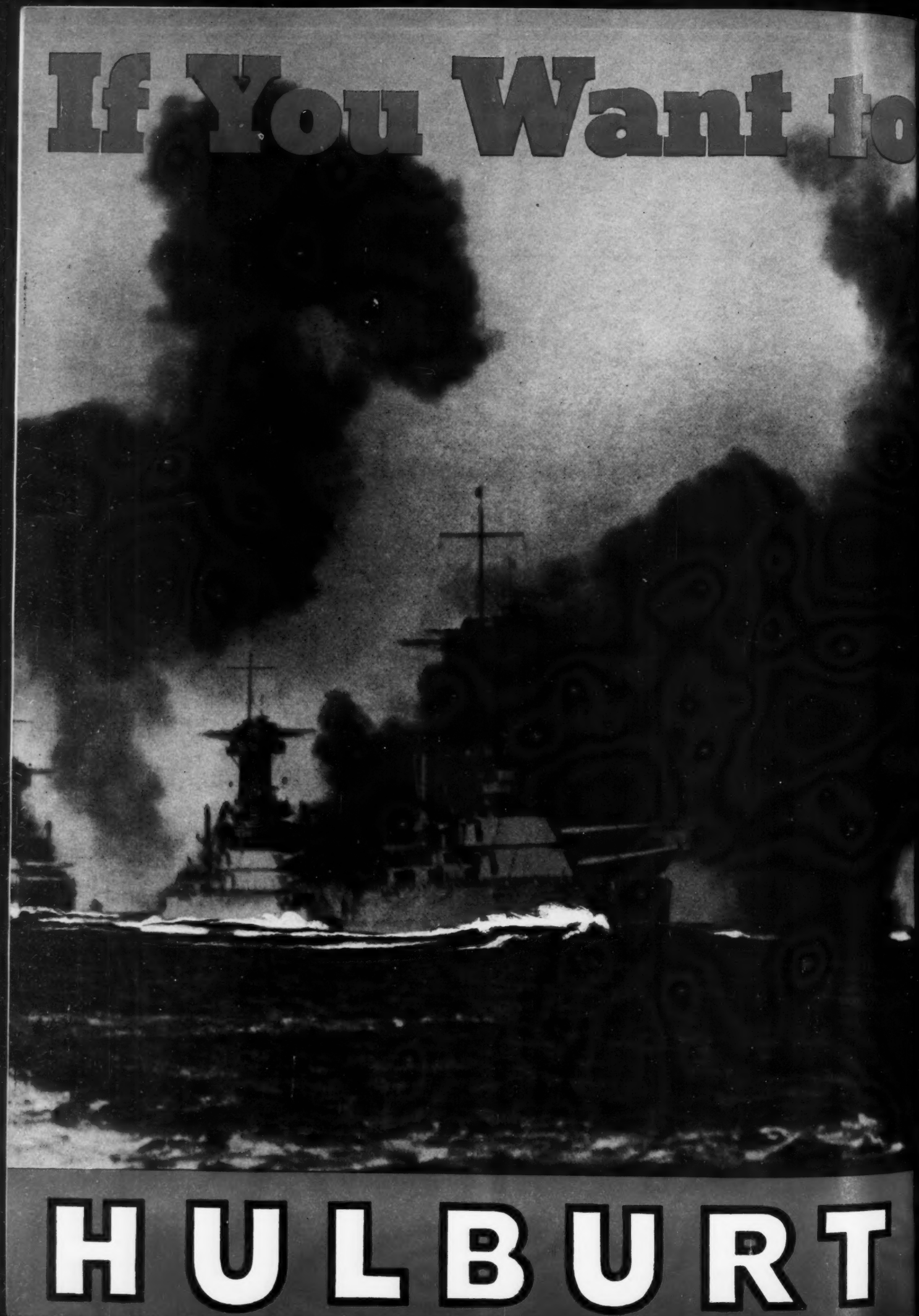
If You Want to
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ADVERTISING PAGES REMOVED

COAL AGE

Established 1911—McGraw-Hill Publishing Company, Inc.

DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

SYDNEY A. HALE, *Editor*

November, 1939

Pertinent and Impertinent

• LET THE BELLS ring out! Oil competition with anthracite is distinctly on the wane because of improved refining processes; government-fixed minimum prices on bituminous coal will diminish the competitive threat from that quarter. This is the happy picture painted by hard-coal carriers in protesting demands for reduced rates to New York Harbor points. Pretty, isn't it?

• THE DOMESTIC STOKER has been frequently hailed—and deservedly so—as the white hope of the coal man in the battle of fuels for the rich domestic market. Gratification over its upward curve of sales, however, should not blind enthusiasts to the unpleasant fact that it still lags behind its competitors in the new-home field. Study of Salt Lake City sales in 1938, for example, showed that only 8 per cent of the stokers sold there last year were installed in new homes, while 77 per cent of the natural-gas heating installations during the same period went into new dwellings. Fortunately, Utah solid-fuel interests have launched a vigorous advertising counter-offensive.

• HOW MUCH do we know about domestic stoker coals and their behavior in the fuel bed? Very little, says Koppers Coal Co. So, following the lines foreshadowed by H. J. Spear, assistant sales manager, when he addressed the Stoker Manufacturers' Association last June, Koppers has established a permanent program of investigation and research to find out more about the stoker coals it produces. And yet there are executives in the industry who still question the value of research.

• AMERICAN CITIZENS have been enjoined to preserve strict neutrality in deed, if not in thought, in the European conflict. No such prohibition has been laid upon the coal industry, however, in the war over the Guffey law. Which is a good thing for the blood pressure of defenders and opponents of coal-price regulation—if, as and when it really becomes effective.

• FOR YEARS a large part of the coal industry thrived on disasters—other people's. A strike or a car shortage opened the door to big profits while that particular emergency lasted. The tendency to capitalize on calamities dies hard. Within the past few weeks, consumers have been warned—not always too subtly—that possible transportation difficulties at home and mounting demand for American coals abroad may jeopardize their fuel supply and price security. Setting forth the facts of the changing situation soberly and without embellishment is a duty the industry owes to its patrons. But frightening timid users with scare-head emphasis is hardly sound sales strategy. Such tactics may send these buyers scurrying to the protective arms of rival fuels.

• COAL'S MECHANIZATION continues apace with a 28 per cent increase in anthracite and a 53 per cent increase in bituminous output per man-hour from 1910 to 1936. But the pace is not swift enough when compared with a 216 per cent increase per man-hour in the total B.t.u. production of petroleum, natural gas and natural gasoline between

1909 and 1937. Incidentally, the value of these petroleum products at wells and extraction plants in 1937 was $1,733,922,000, or more than 60 per cent above the combined value of anthracite and bituminous coal for the same year. Must the race be always to the swift?

• PRODUCERS who secretly welcome the present European situation as presenting a grand opportunity for a profitable clean-up might well ponder on the chilling record of the aftermath of the last war. If they do, they will find that many of their predecessors who cleaned up in great style between 1916 and 1918 were cleaned out in the years that followed.

"Happy Birthday to You"

BORN of war-time necessity and government insistence on a central point of industry contact, the National Coal Association has long since demonstrated its capacity as an effective service agency in years of peace. Those years have not always been pleasant ones for the coal industry. External competition and internal strife seldom have been absent. The period since 1917 not only has tried men's souls but frequently has frayed their tempers and clouded their judgment.

Some of the factional bitternesses developed under such conditions at times have had a disintegrating effect upon the operators' national organization. But not for long, because the responsible leaders have been quick to take the lessons so learned to heart. As a result, the association has been building solidly on the firm foundation of the good of the industry as a whole. It has won confidence and respect because its constructive work has merited such recognition.

From a war baby the National Coal Association has grown to full peace-time stature. Its twenty-two years of existence have been years of service. May it continue to prosper and expand upon that basis—in peace and in war—because it fills a real need in the coal-mining industry.

When Things Go Wrong

STUDIES of possible accidents too often visualize what will happen if no other failures occur than those of the equipment studied, but, if accidents happen in sequences of three, as the superstitious aver, so also are hazards likely to present themselves in groups. A man who has a difficulty in meeting one hazard probably will be overwhelmed when several must be encountered at one time.

In an analysis of accidents, it is necessary often, therefore, to imagine not a single causative condition but two or three occurring simultaneously or in rapid sequence. Too frequently one hears it said: "Why guard against such a combination of conditions; they are unlikely to happen concurrently?" Yet only rarely does an accident occur without a half-dozen cooperating causes being discovered, and some of these may have been long in existence or development. The best text for a sermon on safety is "If."

Coal Rings the Bell

COAL MEN not yet ancient in service can recall when silence was the kindest verdict which could be passed upon many advertising efforts of the industry. As competition has sharpened, however, promotional efforts have improved. More and more individual coal companies are acquiring the art of telling their story effectively and pleasingly to customers and prospects. The stereotyped business card is giving way to copy which recognizes that the purpose of sound advertising is to sell.

This is not alone the judgment of the industry; outside experts, too, are concurring. Signal proof of that fact was given recently when, for the first time in its history, the Direct Mail Advertising Association awarded its Effective Letters Cup to a coal company. Cabin Creek Consolidated Sales Co. was the company so honored. Its winning campaign was planned to give the individual coal merchant greater prominence in his community through an essay contest on "The Place of Solid Fuel in the Development of America's Commerce." This campaign not only enlisted the cooperation of 650 high schools but also added 245 new exclusive accounts for Cabin Creek coals. Intelligent advertising certainly pays.

New Dust Hazards

ALL DANGERS must be reexamined in the light of today's practices—our dependence on rock-dusting among them. Conveyors, which have practically seen their introduction since rock-dusting first was established, may raise into the air microscopic particles unless the coal is wetted down and may drop it from leaky joints and spill it over the sides of trough or belt.

Conveyors, apparently, with perhaps only one exception, have caused no explosions in the United States and possibly will not do so if the same care is taken as at the bigger conveyor systems. Here conveyors have been operating for years without trouble, doubtless because coal is sprinkled as cut, face and faller coal are wetted, and coal is watered again at the face before it is hauled by the conveyor so that dust is not raised on the conveyor line in passing from belt to belt.

With conveyors, since only part of the heading floor is used for travel, the inert and combustible dusts are not mixed by the feet of workmen and the inert dust is free to cake. Road cleansing probably is often less complete and effective because of the interference of conveyors, which also may prevent a good rock-dusting job from being done. The finest of coal dust settles under the conveyor, where it is protected from the air current. In England, where bottom conditions discourage the use of water, trials are being made with machines to feed rock dust into the air so that a deposit of inert dust will occur concurrently with that of combustible dust.

Safety always requires foresight. New conditions are almost sure to bring new hazards—remediable, however, if due recognition be given them.

POLICY, PRACTICES AND COSTS

+ Of Mechanical-Loading Maintenance

At Union Pacific Mines

By CLARENCE A. NOLPH
Assistant Electrical Engineer
Union Pacific Coal Co.

• Spending $116,688.12 for maintaining mechanical-loading equipment to produce almost 3,000,000 tons of coal, constituting 100 per cent of total output, is the Union Pacific Coal Co.'s record for the year 1938. Policies and practices, with labor and material cost of loading-machine maintenance by equipment type and company mining district, are detailed in this story.

MECHANICAL loading was first introduced into the mines of the Union Pacific Coal Co. at Hanna, Wyo., in 1916, when one electrically operated boom-and-dipper-type shovel was installed in No. 4 mine to load top coal, the seam there having a total thickness of 35 ft. From time to time additional units were installed until, by the end of 1918, four of these machines were in operation. Subsequently, late in 1923 and early in 1924, four small mobile loading machines mounted on caterpillar treads were purchased and installed in No. 4 mine, Hanna, for loading both in advance work in rooms and in top-coal recovery, and eventually eight more of these small machines were used.

The boom-and-dipper-type shovels were abandoned after a few years on account of their lack of mobility and due to the difficulty of moving them from one room to another on the heavy pitch of 16 deg.

In 1928 and 1929 the twelve small mobile loaders were replaced by seven larger, stronger, more efficient machines of the same type, in the Hanna mines, and these have in turn now been displaced by much larger, heavier mobile loaders, these machines producing most of the coal from Hanna at the present time.

In April, 1925, a trial scraper was placed in service at Rock Springs, and the following year eight large scraper loaders were installed at the various districts.

Late in 1925, the first shaking conveyor was put into operation at Superior, Wyo., and its performance was so encouraging that this type loader has been purchased in increasing numbers since that time.

In 1928, because of a desire to find employment for a number of older employees who did not fit into the mechanical-loading program, six pit-car loaders were purchased, followed by sixteen the following year. The men operating these pit-car loaders work on a tonnage basis, the same as the old hand loaders.

Table I shows the tons loaded by all mechanical-loading units by years, including 1938. It will be noted that the change from hand loading to mechanical loading was relatively slow on account of our desire not to displace any employee in order to install mechanical-loading units. But, as separations from our service occurred, then mechanical loaders of different types were installed from time to time until, for the year 1938, as shown by Table II, we had 188 units of various kinds in operation. It is interesting to note, by Table II, the different types of loaders in operation.

Table I—Tons Mechanically Loaded Coal, and Percentage to Total Production.

Year	Total Tons Mined	Tons Loaded Mechanically	Per Cent
1916...	3,481,334.65	14,338.85	0.41
1917...	3,283,096.45	23,872.75	0.73
1918...	3,384,068.50	56,447.50	1.67
1919...	2,321,139.00	66,193.35	2.85
1920...	3,069,379.20	50,549.20	1.65
1921...	2,984,534.00	63,878.65	2.14
1922...	2,253,773.95	46,363.15	2.06
1923...	3,241,104.85	107,693.00	3.32
1924...	2,821,677.80	161,523.65	5.72
1925...	2,779,064.54	265,434.40	9.55
1926...	2,776,245.45	601,611.15	21.67
1927...	2,750,430.20	1,107,775.85	40.28
1928...	2,927,389.85	1,501,577.70	51.29
1929...	3,060,632.25	1,774,279.65	57.97
1930...	2,897,653.25	1,721,659.70	59.42
1931...	2,453,527.24	1,800,651.96	73.39
1932...	2,045,270.00	1,659,148.81	81.12
1933...	2,097,558.23	1,899,438.80	90.55
1934...	2,402,552.95	2,340,247.07	97.41
1935...	2,887,731.30	2,881,072.95	99.77
1936...	3,286,159.30	3,284,569.40	99.95
1937...	3,315,628.05	3,315,628.05	100.00
1938...	3,016,977.85	3,016,977.85	100.00

It will be noted that the shaking conveyors number 138 units, and these are all equipped with duckbill loaders. We have found this to be the most serviceable machine for all purposes—that is, in driving entries, rooms, and crosscuts, and for recovering pillars. Some of the other loaders heretofore have not been found adapted to pillar drawing, but further study is being given to this phase of our operations, particularly on the lighter pitches, and we may be able to install a system of pillar drawing with the mobile loaders that will be both satisfactory and economical in operation. The duckbill loading head for the shaking conveyors was developed on the Union Pacific Coal Co.'s property, and had this not been done the shaking conveyors would have been of very little service to us, as the duckbill obviates the hard work of shoveling coal onto the conveyors. With this background of our mechanical-loading operations, a discussion of our

maintenance problems may now be in order.

We found it difficult in our early mechanical-loading experience to change overnight customs, practices, and traditions such as had grown up in the coal-mining industry over many years, especially when men had to be trained to operate the machines. The men who operated the machines were asked to do a job which was entirely different from the one they had heretofore undertaken, and often serious breakdowns occurred through the employee's unfamiliarity with the operation of a certain type of machine. Officials, also, who had not heretofore had the experience had to be trained in the more difficult work of supervising a mechanized mine, which calls for much more talent and initiative among the supervisory personnel.

On this account, maintenance charges were high, for several reasons: (1) Shaking conveyors were not properly set up, the theory being that the machine was of such weight that, if it were set on the floor of the seam and wooden props wedged in tightly, nothing else remained to be done. In some cases concrete foundations were put under the drives, which made moving both slow and expensive. (2) Pan lines too often lacked alignment, proper supports and fastenings, and maintenance from this source was extremely high. (3) There was a distinct lack of inspection. (4) Proper lubrication in the original machines was difficult on account of poor design. This has been practically overcome in the more recent machines installed by the manufacturers giving much care and attention to this phase of the units' construction. (5) The metal used was of very poor quality. The most serious breakdowns with shaking conveyors occurred from poor material and poor design. Frequent and costly repairs were necessitated by breaking of the main frames and stripping of the cast-iron gears. With the substitution of steel gears and more attention paid to the setting up of the units, the maintenance from this source has been greatly reduced. (5) The introduction of the duckbill, while it has proved an extremely useful method of loading coal, placed an additional strain and duty upon the driving unit, resulting in greater maintenance costs. In more modern units, this has been compensated by providing more rigid construction in the drive, with steel of very much better quality. This, of course, was particularly true of the shaking conveyors. (7) Maintenance costs were often high, too, because, having a relatively small number of machines, the mine superintendents hesitated to take one out of operation for minor repairs with consequent loss of production, the net result being that the machines were often patched to keep them going over a long period of time, necessitating, in the final analysis, much more extensive repairs and replacement of parts.

Table II—Location of Mechanical Loading Units, all Types, Year 1938.

	Rock Springs	Reliance	Winton	Superior	Hanna	Total
Scrapers	.....	2	.....	.....	.....	2
Shaking Conveyors	39	24	28	43	4	138
Pit-Car Loaders	23	.....	.....	10	.....	33
Mobile Loaders	.....	1	.....	1	8	10
Drag Conveyors*	5	.....	.....	.....	.....	5
Total	67	27	28	54	12	188

* Drag conveyors operate with shaking conveyors.

Table II—Location of Mechanical Loading Units, all Types, Year 1938. Year 1938.

District	Tonnage	Labor Amount	Labor Per Ton	Material Amount	Material Per Ton	Total Amount	Total Per Ton
Rock Springs							
Shaking Conveyors	600,379.90	$19,989.43	$0.033	$18,830.16	$0.032	$38,819.59	$0.065
Pit-Car Loaders	74,372.10	2,754.23	0.037	1,841.36	0.025	4,595.59	0.062
Total	674,752.00	$22,743.66	$0.034	$20,671.52	$0.030	$43,415.18	$0.064
Reliance							
Shaking Conveyors	448,116.15	9,408.11	0.021	10,654.61	0.024	20,062.72	0.045
Scrapers	106,556.85	1,408.31	0.013	2,242.54	0.021	3,650.85	0.034
Mobile Loaders	29,594.20	347.70	0.012	860.30	0.029	1,208.00	0.041
Total	584,267.20	$11,164.12	$0.019	$13,757.45	$0.024	$24,921.57	$0.043
Winton							
Shaking Conveyors	538,843.40	1,957.92	0.004	8,597.66	0.016	10,555.58	0.020
Superior							
Shaking Conveyors	663,203.20	6,704.85	0.010	5,930.78	0.009	12,635.63	0.019
Pit-Car Loaders	19,538.55	80.08	0.004	.....	.....	80.08	0.004
Total	682,741.75	$6,784.93	$0.010	$5,930.78	$0.009	$12,715.71	$0.019
Hanna							
Shaking Conveyors	32,991.20	461.20	0.014	1,301.08	0.039	1,762.28	0.053
Mobile Loaders	448,030.40	10,073.89	0.022	13,243.91	0.030	23,317.80	0.052
Total	481,021.60	$10,535.09	$0.022	$14,544.99	$0.030	$25,080.08	$0.052
Grand Total	2,961,625.95	53,185.72	0.018	63,502.40	0.021	116,688.12	0.039
		Recapitulation					
Shaking Conveyors	2,283,533.85	38,521.51	0.017	45,314.29	0.020	83,835.80	0.037
Scrapers	106,556.85	1,408.31	0.013	2,242.54	0.021	3,650.85	0.034
Mobile Loaders	477,624.60	10,421.59	0.022	14,104.21	0.029	24,525.80	0.051
Pit-Car Loaders	93,910.65	2,834.31	0.030	1,841.36	0.020	4,675.67	0.050
Total	2,961,625.95	$53,185.72	$0.018	$63,502.40	$0.021	$116,688 12	$0.039

Conveyors Most Important

With regard to operation of other types of machines, while the repairs have been high, particularly in the case of the mobile loaders, the relatively small number of these machines in operation required much less supervision and inspection, and these, of course, have not been so much of a problem as the shaking conveyors. This is true also of the pit-car loaders and the scrapers.

One large item entering into maintenance for the scrapers has been the high cost of the ropes. This has been cut down considerably in recent years by using second-hand rope from some of the main slopes, and, where this supply has been insufficient, we have gone on the market

and purchased second-hand rope at relatively low cost. Rope of this kind which has been used apparently suffers fewer breaks and gives better service than new rope, which was used almost entirely during the early years of the scraper installations.

With our experience of many years covering mechanical-loading operations, much has been learned with regard to maintenance. Table III is interesting inasmuch as it shows the cost of maintenance of mechanical-loading equipment at all of our mines for the year 1938.

Maintenance-Cutting Rules

1. We insist that machines shall be set up in proper alignment, anchored with iron jack pipes, that all bolts and bearings must be properly tightened, and that all pan lines must be set in proper alignment, with wooden frames under roller cradles at all pan joints, these supported and held in place with props.
2. We insist on rigid and careful inspection of all operating units.
3. Lubrication must be properly taken care of. If this is not done, much valuable machinery will be out of commission for a long period of time.
4. We insist that small defects be repaired as soon as possible after they develop, in order to prevent their growing into major defects, resulting in costly delays and requiring heavy repairs.

During recent years, our labor situation has entirely changed. As older employees left the company's service, young men, many of them graduates from the high schools in our mining districts, have been employed. These young men are interested in mechanics and pick up this work quickly, becoming well informed in a short period of time as to the necessity of giving the loading units proper care. This has tended immeasurably to cut down maintenance charges. Also, the ability to purchase high-grade steel and the use of the oxyacetylene cutting and welding torch have both contributed greatly to the decrease in the cost of maintenance. In this manner, repairs can be made promptly and the machine returned to operation in a very short time.

Machines of the older type have to be rebuilt twice a year, and those of the newer type will run three or four years before a general overhaul is necessary. Whenever the necessity arises for a general overhaul, the work is not put off, with the result that we have fewer breakdowns and the machines are kept in more continuous operation.

Now, a word about our organization may be in order. Each district has its outside machine, electric and welding shops where all major machine-reconditioning jobs are handled. The surface personnel consists of the superintendent, who coordinates all departments in the district; a chief electrician, who has charge of all electrical equipment; a master mechanic, who supervises all mechanical equipment; and the outside foreman, who is responsible for all tipple operations and the delivery of material.

Foreman Controls Operations

The underground supervisory force consists of a mine foreman, who controls all operations; a machine boss, who acts in the capacity of assistant to the mine foreman and who is responsible for all machine maintenance and the supervision of the work of the repair men; several section foremen, each of whom is responsible for the operations in one of the many sections into which the mine is divided, a section usually being a division of the mine which employs four to six mechanical-loading units. The number of section foremen is determined by the size of the mine.

No one repair man or section foreman who is responsible for the condition and operation of machinery is assigned to one section of the mine for any great period of time. It has been my experience that more effective work will be done if the man who is qualified to do one job more efficiently than another is assigned to that job regardless of what section of the mine it may be in. Cooperation on the part of all persons responsible for the maintenance and operation of mechanical-loading equipment and minute and careful inspection of that equipment are the only tools which can be effectively employed in reducing the number of delays and the cost of production. The Union Pacific Coal Co. has been successful in keeping its maintenance costs at a reasonably low figure as shown in the cost data, Table III, only through this personnel cooperation and frequent inspections.

Inside Force for Repairs

The inside maintenance force is responsible for making all repairs on machinery, reconditioning machines at the shop, and wiring all electrical equipment. Maintenance men are often assigned special jobs from time to time. For example, one of these special jobs may be the cleaning of the oil and accumulated coal dust from the brushholders, brushes and commutators on cutting machines. If such foreign material is allowed to accumulate over a period of time, an armature failure will result, which means a major delay that might have been prevented.

Coordination of the activities of all departments in and about the mines and cooperation of the personnel, along with rigid periodic inspections of machinery, are the three most important factors which, taken together, keep mining-equipment maintenance costs and problems at a minimum for the Union Pacific Coal Co.

NEW 1,000-TON LINDBERGH MINE

+ Has Jig and Table Washers

To Prepare Conveyor-Mined Product

By F. A. MASH
Mining Engineer

and J. H. EDWARDS
Associate Editor, Coal Age

• With the opening of a new property at Lindbergh, Ala., the Brookside-Pratt Mining Co. now has four operating mines and has added a second producer from the Pratt seam, which is the source of a large percentage of the coal used in making metallurgical coke in the Birmingham district. The preparation plant, designed for loading 1,000 tons per day and including an automatic jig and two tables, also has complete screening and loading facilities for domestic sizes. The coal is hand-loaded onto conveyors operating on 200-ft. faces.

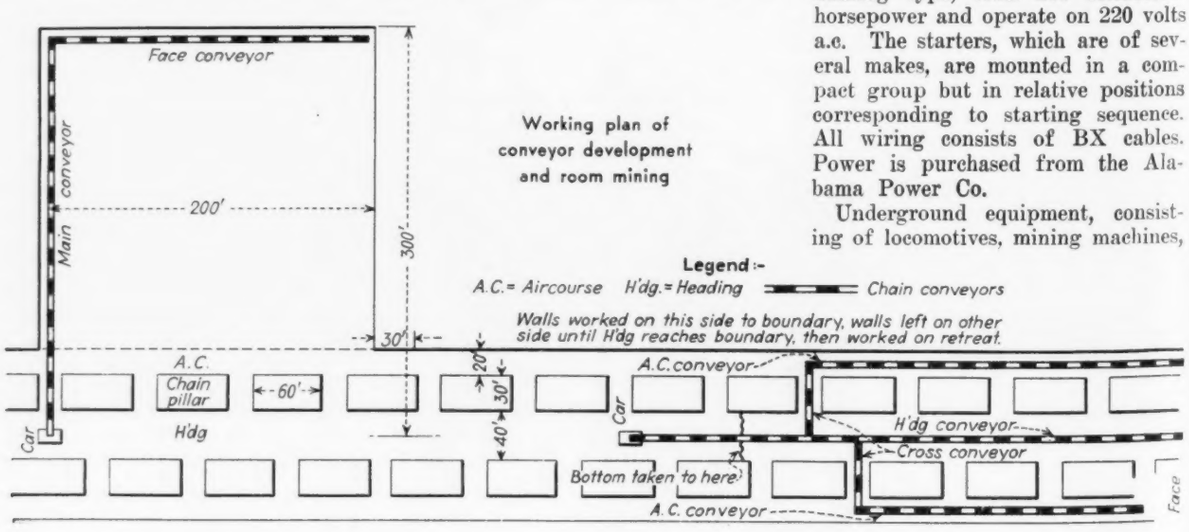
LYING nearly level in the Lindbergh mine, the Pratt seam averages 32 in. in thickness and contains a ½- to 3-in. parting 6 in. from the top. The opening is a drift into the crop at a point 1,500 ft. from the tipple. Top material is a sandy shale and the bottom a hard fireclay. Six million tons of coal is available to this new mine. It is situated in Jefferson County, 18 miles from Birmingham, and on the St. Louis & San Francisco Ry. The coal is in the medium-volatile class and has a high grindability index, so is well adapted to pulverized firing.

Preliminary work on the mine was started in July, 1936, and run-of-mine only was shipped until the preparation equipment was completed early last year. The plant loads four sizes on three tracks and includes one boom of the belt-conveyor type for loading larger sizes. Coal enters via a Phillips cross-over dump and passes to a main shaker which screens out the 4x0-in. for washing. The plus 4-in. is hand-picked on the main shaker screen. On a 4x8-ft. vibrating screen the product to be washed is separated into 4x⅜- and ⅜x0-in., the former going to the jig and the latter destined for the tables.

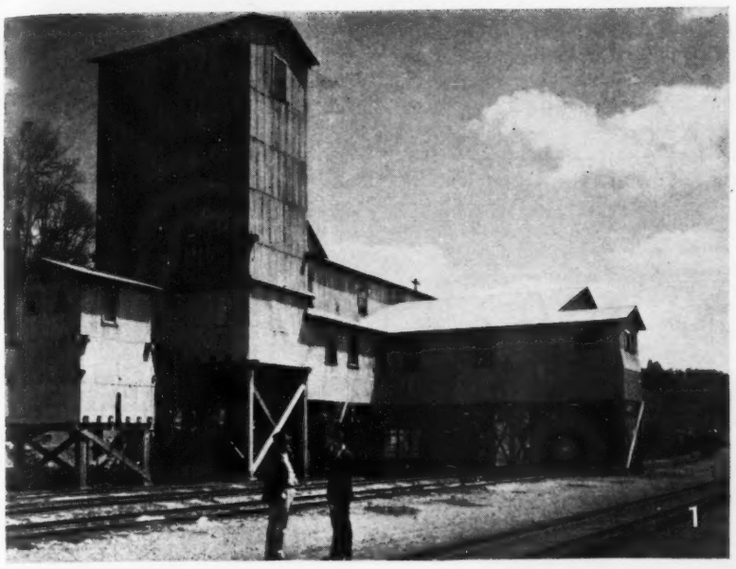
The jig is a Jeffrey automatic single-compartment type rated 60 tons per hour. Washed coal from the jig is rescreened on a 4x8-ft. double-deck vibrator to the sizes 4x ½- and ½x⅜-in. Two Deister Plat-O tables wash the ⅜x0-in. and all three of the washed sizes pass to a three-compartment drag conveyor which elevates several feet and includes a horizontal run situated above the rear end of the loading-boom conveyor. Valves in the bottom run provide for loading each washed size separately, mixing them together and reassembling with the hand-picked lump or mixing to any one of several combinations. Washer and hand-picked reject are conveyed to a truck-loading bin adjacent to the washer.

Plant motors (Westinghouse and General Electric) are new and ball-bearing type, total 100 connected-horsepower and operate on 220 volts a.c. The starters, which are of several makes, are mounted in a compact group but in relative positions corresponding to starting sequence. All wiring consists of BX cables. Power is purchased from the Alabama Power Co.

Underground equipment, consisting of locomotives, mining machines,



Working plan of conveyor development and room mining



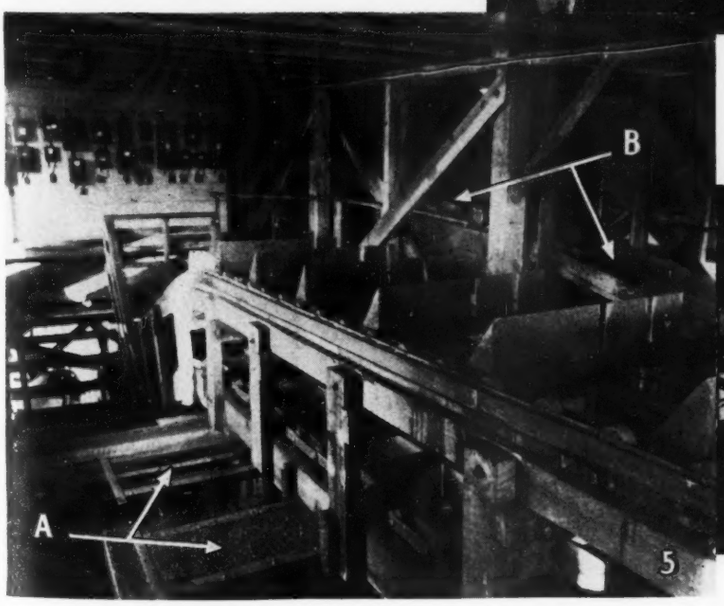
1—Built for thorough preparation of 1,000 tons per day. W. H. Powell, left, and F. A. Mash, right.

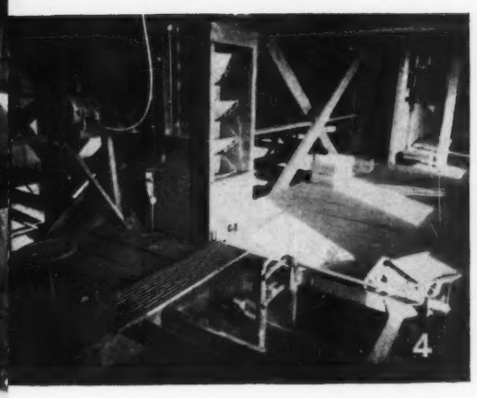
2—F. A. Mash, chief engineer and preparation manager, snapped at the new Lindbergh plant.

3—Bottom view of the diaphragm jig showing ball-bearing gear-motor drive.

4—Top view of the diaphragm jig in which the 4x⅜-in. coal is washed.

5—The three washed sizes are brought to the loading chutes and booms in this three-compartment mixing conveyor. Letters "A" indicate valves in the bottom run of the conveyor and letters "B" show position of main screen. Motor starters in sequence positions are to be seen in left background.





coal drills and conveyors, operates at 250 volts d.c. At present this d.c. power is supplied by a 150-kw. motor-generator substation with manual starting and automatic feed. Rooms are driven 200 ft. wide and 270 ft. deep (300-ft. room conveyor length from center of haulage heading) with Jeffrey Type 61AM chain conveyors and the coal is delivered into cars directly by the room conveyor which extends across the aircourse to the haulage heading on which bottom is lifted to the extent of 4 ft. Mine cars are roller-bearing, wood-body type and carry 1½ tons.

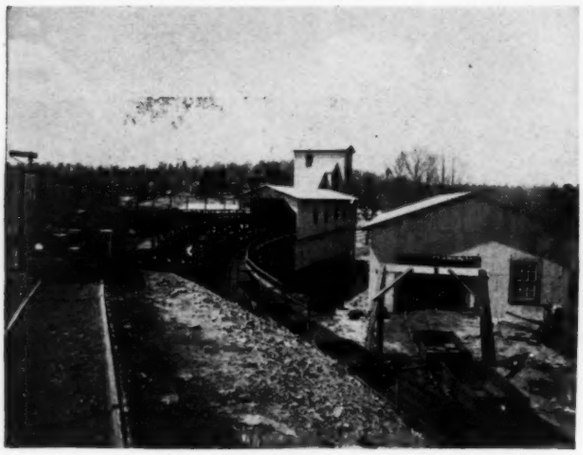
Undercutting is done with Jeffrey and Sullivan longwall machines with 6½-ft. bars and using standard bits tipped with borium. The drilling is done with Chicago Pneumatic No. 472 drills. Permissible powder is used and the holes are spaced 8 ft. apart. Cutting, drilling, shooting and conveyor moving are done on a second shift and the loading on the regular day shift. Six men load on the 200-ft. face.

Room ventilation is conducted by line brattices. Cover over the territory allotted to the mine ranges up to 250 ft. Pillars 30 ft. wide are being left and the room timbering consists of posts on 3-ft. centers. No posts are pulled.

The entry, which consists of two 20-ft. aircourses and a 40-ft. haulage heading between them, is advanced 300 ft. with each conveyor set-up. As indicated by the drawing, the haulage-heading conveyor acts as a mother conveyor for the aircourse and cross conveyors. This haulage-heading conveyor extends back 75 ft. over the section where bottom has been taken, thus affording opportunity to load a trip of cars without switching. The bottom rock, which is taken up to single-track width on the haulage heading, is gobbed along both sides.

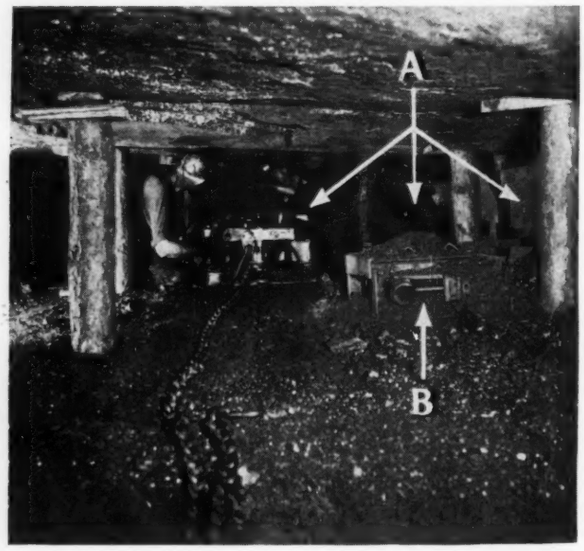
A. R. Long is president of the Brookside-Pratt Mining Co. and J. H. Moore is vice-president in charge of sales. Design and construction of the plant was under the direction of F. A. Mash, who is mining engineer and preparation manager. W. A. Bell is general superintendent of mines and W. H. Powell is superintendent of the Lindbergh mine.

Beginning to snake the longwall cutter along the 200-ft. face to start the cut at right-hand corner. "A" indicates tailpiece of room conveyor.



Pushing a trip to the tipple, which is equipped with a cross-over dump.

Car trimmer on the haulage heading where 4 ft. of bottom has been lifted.



Looking along 200-ft. face from left-hand corner of room as mining machine is starting its trip to far end to begin cut. "A" is face conveyor and "B" tailpiece of room conveyor.

WILL EUROPEAN CONFLICT

Create Major Coal-Export Boom?

POSSIBILITIES of a war boom in coal exports once more have captured the imagination of American producers. Although the United States tops all other nations in total coal reserves, under normal conditions it ranks a poor third in annual exports. And it holds that place only by virtue of its shipments to Canada. Eliminate that trade and its position in the coal-export picture would be woefully insignificant.

Today, however, nations which for years have shown little or no interest in American coals are making inquiries and placing orders. Since Sept. 1, shipments have been made to Scandinavian countries which have not bought here for more than a decade. South America, which imported less than 225,000 gross tons of bituminous coal from United States last year, is turning its eyes northward. Canada, once a market for several million tons of anthracite, is now seeking Pennsylvania hard coal to replace British and German coals.

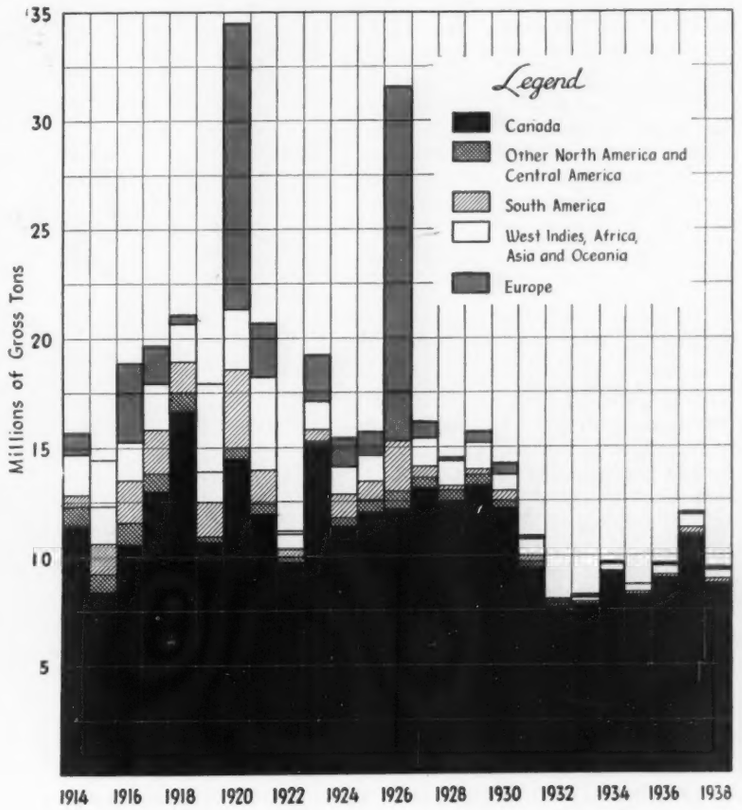
Charted History

Such developments revive moribund interest in the history of United States coal exports during the World War of 1914-18 — and afterward. This history is shown graphically in the chart below. During the first year of that war, bituminous exports from this country totaled less than 16,000,000 gross tons; 89 per cent of that total moved to North and Central American markets and to the West Indies.

Although Europe more than doubled its imports in 1915, total exports that year were less than in 1914. Compared with 1914, the closing year of the war showed an increase of 5,342,966 tons in total exports. European sales, however, had fallen below the 1914 figures, while exports to Canada were 5,220,665 tons greater.

All-time highs for exports from this country were made in 1920 and 1926, when British shipments were curtailed by labor troubles. During 1920, bituminous exports from this country to Europe rose to 13,161,460 tons; in 1926, to 14,111,824 tons. In no year since has the total reached 1,000,000 tons; last year it was just under 10,000 tons and in 1934 not a single cargo was cleared for European ports.

Bituminous exports to South America climbed from 568,462 tons in 1914 to 2,039,448 tons in 1917. Here, too, the peaks were made in 1920 and 1926, when the exports were 3,525,039 and 2,437,077 tons, respectively. Since then the trend generally has been downward. The same general trend also has governed movement to the West Indies, although the peak in Caribbean exports was registered during the war years. Africa, Asia and Oceania have been inconsiderable and fluctuating factors in the picture.



A quarter-century picture of bituminous-coal exports from the United States.

BITUMINOUS INDUSTRY

+ Pledges Continued Campaign

To Widen Markets for Coal

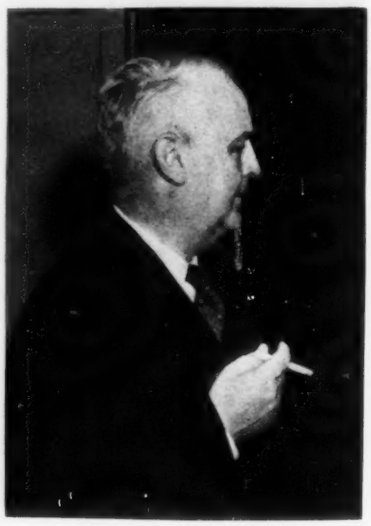
Heath S. Clark
Starts the ball rolling at N. C. A. Meeting

MEMBERS of the National Coal Association, meeting at the Roosevelt Hotel, New York City, Oct. 23–25, went on record in favor of continuing the organization's campaign to promote the wider use of bituminous coal and authorized the expansion of that program "within the limits of available funds." Opposition to government competition in the hydro-electric field, as typified by TVA and the proposed St. Lawrence River project, was reaffirmed and reiterated.

Research was brought to the fore in a meeting of stockholders of Bituminous Coal Research, Inc., held prior to the formal opening of the National convention, and in an address by J. K. Hunt, chemist, E. I. du Pont de Nemours & Co., who asserted that scientific research was the key to future prosperity in the industry. Its importance also was touched upon in reports presented by Heath S. Clark, retiring president, and John D. Battle, executive secretary. Research also was the theme of a talk by Bert H. White, vice-president, Liberty Bank, Buffalo, N. Y.

Safety in bituminous mining had its innings in an open forum participated in by J. William Wetter, receiver, Rockhill Coal Co.; F. E. Bedale, safety director, Consolidation Coal Co., and John E. Jones, safety engineer, Old Ben Coal Corporation. A report of the association's special committee on taxation, headed by D. D. Hull, president, Virginia Iron, Coal & Coke Co., pressed for an increase from ½c. to 3c. per gallon in the excise tax on imported oil and for the repeal of the "unjust enrichment" section of the internal revenue act as the tonnage tax imposed on code members under the Guffey law.

Anti-Guffeyites were urged by Harold L. Ickes, Secretary of the Interior and administrator of the present coal-control statute, to forego their opposition and to cheerfully cooperate in the working out of the law in the interest of the common good. "This is not the time," he said, to drive "for a new or different act. We must first see whether the one we have will work. I promise you as



Charles C. Dickinson
President-elect, National Coal Association

honest, efficient and impartial administration of this statute as I am capable of giving. I also promise you that, if it is given a fair trial and then proves wanting, I will join you in seeking its modification." Just when the industry may expect minimum prices to be promulgated, however, was a question upon which Mr. Ickes declined to commit himself.

Coal is only one part of the natural resources picture. Ultimately the nation may take steps to coordinate the conservation of all forms of fuel and energy in the interests of the nation as a whole and for the welfare of the affected industries. "We cannot," insisted the speaker, "afford to let any major industry, no matter how much it wants to do so, bankrupt itself. Every business and industry is an integral part of a whole, like the strands in a tapestry. You cannot tear one without damaging the whole fabric."

Stabilization through price fixing and enforcement, maintained Mr. Ickes, should put an end to further economic wreckage resulting from wasteful methods of mining. He believed such stabilization "will stop the crumbling of the investments and the wastage of the livelihoods of thousands engaged in the industry." But achievement of stabilization requires the cooperation of all elements in the industry and also of the consuming public. On the basis of average costs for the last nine months of 1937, an average increase of 11c. per ton in prices would return the costs of production

Marketing agencies, explained R. E. Howe, president, Appalachian Coals, Inc., in an open forum on the subject presided over by R. L. Ireland, Jr., president, Hanna Coal Co., are not just price-fixing bodies. They can study the character of the coals produced by their members; determine the best markets for such coals; seek new markets; collect valuable distribution statistics and help the consumer solve his problems. Marketing agencies, added J. D. Francis,

On the firing line
Charles O'Neill reports on government relations

Illinois and Indiana meet
R. H. Sherwood and W. J. Jenkins talk it over

No red ink for N.C.A.
Treasurer Ord reports on finances

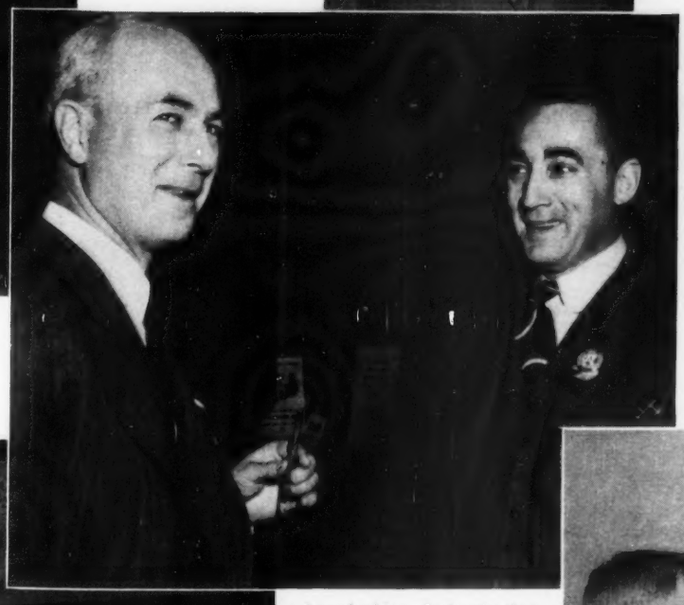
Father and son
H. L. Gandy and Harry, Jr.

Counting noses
Charles E. Owen convention chairman

"The meeting will come to order"
Henry T. DeBardeleben, Sr., presiding

A smile from A.C.I.
R. E. Howe enjoys the convention.

of secretaries
ean Kennedy
down the law



On the side lines with central Pennsylvania
Walter Jones and J. Wm. Wetter in lobby powwow

Appalachian fraternization
C. E. Cowan and Raymond Salvati

Executive Secretary tells all
John D. Battle reviews N. C. A. activities

A huddle on research
Clyde E. Williams J. B. Morrow and E. K. Kaiser check up

president Island Creek Coal Co., should not be used as a crutch.

Only when the members show a real and continuing interest in its operations, said E. R. Keeler, president, Franklin County Coal Corporation, can a marketing agency or group be successful. The real problem of the industry, in the opinion of R. D. Stockdale, president, Red Jacket Coal Sales Corporation, is the bottle neck of marketing. Daily clearing of sales records and no-bill position of each member to the sales agency, stated R. H. Moore, president, C. A. Hughes & Co., prevents misunderstandings because all members then have correct information on the existing situation.

Government regulation, remarked Herbert S. Salmon, president, Alabama Coals, Inc., is no cure-all; what the industry wants is security, and marketing agencies, which have a real place under the act, help contribute to that security. The individual operator, observed E. L. Greever, calls upon the construction engineer, the chemist, the mining engineer and other specialists in building and operating his mine plant. But what about marketing? To try to take on that job alone is an impossible task; here the producer needs the expert help of the properly organized marketing agency, which can see that his coal is sold in the right markets and to the right people.

Increased membership and continued solvency for the association were emphasized by Mr. Clark in his report presented at the opening session of the meeting, presided over by Henry T. DeBardeleben, president, DeBardeleben Coal Corporation. Normal expenditures have been kept well within current income, but surplus was drawn upon for the association's marketing program "and its very modest contribution to research." The public and government relations committee, said Charles O'Neill, president, United Eastern Coal Sales Corporation and chairman of the committee, has been active in the fight against government hydro-electric competition, the drive for an increased tax on imported oil and in seeking amendments to the gas act which would "remove inequalities and discrimination with respect to coal."

Continued opposition to compulsory stream-pollution legislation was recommended by the committee. Under committee sponsorship, the report continued, a comprehensive study had been made of the effects of a 30-hour week. Such a shortening of hours would, it was stated, boost production costs nearly 25c per ton on the basis of 1936 figures. The committee also concluded that present conditions do not permit it to make suggestions for amendments to the Guffey act "at this time."

Market-promotion activities of the association were specially stressed in the report of Executive Secretary Battle. These have included posters and other literature prepared by the association and distributed through its members, and a modest advertising campaign in a selected list of industrial media. "Our competitors," Mr. Battle pointed out, "spend millions where we spend hundreds. Our railroad friends spend millions to tell the public the advantages of rail travel. I am not complaining. I am sure that, as time goes on, we will spend millions and it will all come back twofold, for we live today in an advertising age."

National Coal Officers and Directors

Charles C. Dickinson, president, Dickinson Fuel Co., Charleston, W. Va., was elected president of the National Coal Association at the New York City convention last month. Vice-presidents named were: W. L. Robison, president, Youghiogheny & Ohio Coal Co., Cleveland, Ohio; Henry T. DeBardeleben, president, DeBardeleben Coal Corporation, Birmingham, Ala., and Moroni Heiner, president, Utah Fuel Co., Salt Lake City, Utah. Col. W. D. Ord, president, Elkhorn Valley Coal-Land Co., Landgraff, W. Va., was re-elected treasurer, and John D. Battle was renamed executive secretary.

The directors were increased from 41 to 46. In addition to Messrs. Dickinson, Robison, DeBardeleben and Heiner, the personnel is:

O. L. Alexander, president, Pocahontas Fuel Co., Inc., New York City.

C. E. Bockus, president, Clinchfield Coal Corporation, New York City.

J. G. Bradley, president, Elk River Coal & Lumber Co., Dundon, W. Va.

J. E. Butler, president, Stearns Coal & Lumber Co., Stearns, Ky.

Wm. G. Caperton, president, Smokeless Coal Corporation, New York City.

C. T. Carney, vice-president, Scandia Coal Co., Des Moines, Iowa.

Heath S. Clark, president, Rochester & Pittsburgh Coal Co., Indiana, Pa.

Ira Clemens, president, Commercial Fuel Co., Pittsburgh, Kan.

E. H. Davis, vice-president, New York Coal Co., Columbus, Ohio.

George C. Eastwood, president, Consolidated Coal Co., Saginaw, Mich.

J. D. Francis, president, Island Creek Coal Co., Huntington, W. Va.

L. Ebersole Gaines, president, New River Co., Mount Hope, W. Va.

C. W. Gibbs, general manager, Harwick Coal & Coke Co., Pittsburgh, Pa.

George B. Harrington, president, Chicago, Wilmington & Franklin Coal Co., Chicago.

Calvin Holmes, president, Holmes-Darst Coal Corporation, Knoxville, Tenn.

D. D. Hull, president, Virginia Iron, Coal & Coke Co., Roanoke, Va.

R. L. Ireland, Jr., president, Hanna Coal Co., Cleveland, Ohio.

R. E. Jamison, vice-president, Jamison Coal & Coke Co., Greensburg, Pa.

W. J. Jenkins, president, Consolidated Coal Co., St. Louis, Mo.

T. E. Johnson, vice-president, Hutchinson Coal Co., Fairmont, W. Va.

R. H. Knode, president, Stonega Coke & Coal Co., Philadelphia, Pa.

George J. Leahy, vice-president, Little Betty Mining Corporation, Chicago.

George H. Love, president, Union Collieries Co., Oakmont, Pa.

J. F. Macklin, president, J. H. Weaver & Co., Philadelphia, Pa.

Crawford C. Madeira, sales manager, Rockhill Coal Co., Philadelphia, Pa.

E. C. Mahan, president, Southern Coal & Coke Co., Knoxville, Tenn.

Fred S. McConnell, vice-president, Enos Coal Mining Co., Cleveland, Ohio.

Douglas Millard, manager of sales, fuel and byproducts divisions, Colorado Fuel & Iron Co., Denver, Colo.

J. D. A. Morrow, president, Pittsburgh Coal Co., Pittsburgh, Pa.

T. C. Mullins, president, Northern Illinois Coal Corporation, Chicago.

Charles O'Neill, president, United Eastern Coal Sales Corporation, New York City.

Charles A. Owen, president, Imperial Coal Corporation, New York City.

D. H. Pape, president, Sheridan-Wyoming Coal Co., Monarch, Wyo.

George W. Reed, vice-president, Peabody Coal Co., Chicago.

W. C. Shank, president, Crowe Coal Co., Kansas City, Mo.

J. Noble Snider, vice-president, Consolidation Coal Co., Inc., New York City.

K. A. Spencer, vice-president, Pittsburg & Midway Coal Mining Co., Pittsburg, Kan.

Grant Stauffer, president, Hume-Sinclair Coal Mining Co., Kansas City, Mo.

Arthur B. Stewart, president, Davis Coal & Coke Co., Baltimore, Md.

C. W. Watson, president, Elk Horn Coal Corporation, Cincinnati, Ohio.

J. P. Williams, Jr., president, Koppers Coal Co., Pittsburgh, Pa.

L. E. Woods, president, Crystal Block Coal & Coke Co., Huntington, W. Va.

Mr. Ord and C. F. Spencer, president, Pittsburg & Midway Coal Mining Co., Pittsburg, Kan., retired as members of the board. New members elected were Messrs. Davis, Gaines, Jamison, Johnson, Mullins, Reed and K. A. Spencer.

More than 46,000,000 tons of bituminous coal was used for chemical purposes last year, according to Dr. Hunt. Chemical products derived from coal through research, he added, have contributed materially to American self-sufficiency. The United States owes much of its present economic security to research based on coal, which has become increasingly important as a chemical raw material since the first coal-tar dye was made by William Perkins in 1856. As examples of important synthetic products using coal as a basic raw material, Dr. Hunt mentioned neoprene, selling at less than the price of natural rubber during the early World War days, and nylon, the fibers of which are now being used in the manufacture of fine hosiery.

Possibilities of enlarged markets for coal were discussed at the meeting of stockholders of Bituminous Coal Research, Inc., held on Oct. 24, with John C. Cosgrove, who is retiring from the presidency of the organization, presiding. There are large potential markets, declared E. R. Kaiser, assistant to the president, that bituminous coal has not been able to enter because the necessary coal-consuming equipment has not been developed.

Mr. Kaiser reported that 58 per cent of the funds necessary to begin the new program planned for next year (*Coal Age*, May, 1939, p. 66) have been pledged and that additional groups are now considering support of the program on the basis of an assessment of one-third mill per ton. Several associations already have agreed to levy such an assessment for the next three years. National Coal Association and some individual producers also have pledged substantial sums.

Failure of the industry to support research more strongly, declared Fred S. McConnell, vice-president, Enos Coal Mining Co., at the concluding session, presided over by George W. Reed, vice-president, Peabody Coal Co., is due more to a lack of vision than a lack of money. If coal is to hold its place, remarked Mr. Reed, manufacturers of coal-burning equipment must be prepared to render prompt service; he waited three days once to have a residential stoker repaired, but the gas company is on the job in an hour when a gas furnace goes sour. He would like to see the National Coal Association encourage the organization of proper service and push research for stoker service and the use of powdered fuel in diesel engines.

HOW MERCURY-ARC RECTIFIERS + Meet the D.C. Power-Supply Problems Of the Coal-Mining Industry*

By D. E. RENSHAW
Industry Engineering Dept.
Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

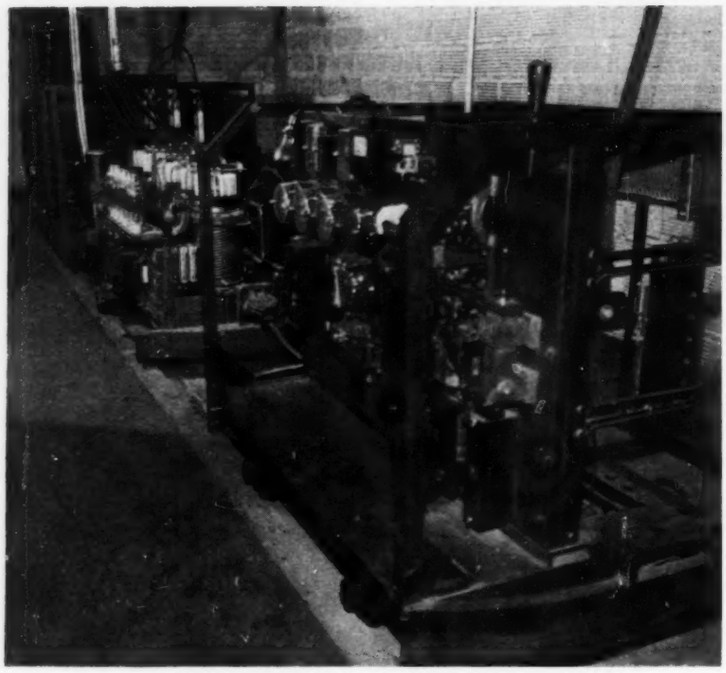
ALTHOUGH mercury-arc rectifiers at present constitute only a small part of the total installed capacity of a.c. to d.c. conversion equipment in coal mines, in the past three years 21 rectifiers with a total rated capacity of 8,100 kw. have been placed in service in fifteen coal mines. Considered alone, this would not be important, but, since these rectifiers exceed in number of units and capacity other forms of new conversion equipment installed in the same period, a definite trend toward the use of rectifiers is indicated. It is the purpose of this article to discuss the causes for this trend and to record, in so far as it is possible, the results which have been obtained with rectifiers in mining service.

Two developments are responsible for this interest in rectifiers. First is the increasingly rapid change from hand-loading methods to concentrated operation with machine loading. If the large investments in mining machines required for mechanical mining are to be profitable, these investments must be backed up by a power supply which is efficient and which is adequate to supply an uninterrupted flow of power to the mining machines. The second is the development of the Ignitron rectifier, which can be used advantageously for 275-volt service and for higher voltages. Prior to 1936, only the tank-type, or multi-anode, rectifier was available, for which the principal field of application is at 500 volts and higher. Since by far most of the coal is produced by 275-volt mines, it was not until the Ignitron was developed for large capacity that rectifiers really became available to the coal-mining industry as a whole.

The beginning of the modern trend to rectifiers is marked by the installation of a 600-kw. 600-volt tank-type rectifier by Pittsburgh Coal Co. in August, 1936. A. Lee Barrett has stated that this unit is saving 26.5 per cent of its cost per year due to increased efficiency. The rectifier serves a mine working three shifts per day and 600 shifts or more per year.

The year 1937 saw two installations which produced several "firsts." In February, the Union Collieries Co., Pittsburgh, placed a 300-kw., 275-volt d.c., 2300-volt, 3-phase, 60-cycle Ignitron equipment in an underground station approximately two miles from the shaft bottom. This equipment may be briefly described as consisting of an automatic control, an Inerteen filled transformer, a six-

* Abstract of paper entitled "Mercury-Arc Rectifiers in the Coal-Mining Industry," presented at the Middle-Eastern District meeting, American Institute of Electrical Engineers, Scranton, Pa., Oct. 11-13, 1939.



Portable Ignitron substation at Isabella mine, Weirton Coal Co.

tube Ignitron rectifier and a water-to-air heat exchanger for cooling the rectifier. Because of clearance conditions in the main haulageway, the maximum height of any part is 55 in. and the maximum width 62 in.

In October, 1937, the Weirton Coal Co. installed three portable Ignitron rectifiers to be the first mine: (1) to be served solely by rectifiers; (2) to use portable rectifiers; (3) to make all its substations portable; (4) to place all its conversion equipment underground.

This equipment is essentially the same as the Union Collieries Co. equipment except that it is mounted on three trucks. The transformer and a.c. switchgear are on one truck, the rectifier and its auxiliaries and the heat exchanger on the second, and the d.c. switchgear on the third. Installations in 1938 followed essentially the pattern established in 1937.

In 1939, two noteworthy advances have been made. Three 600-volt Ignitron rectifiers have been placed in service, all of these being of the non-portable type in surface substations. The second innovation, which may be the more important, is the use of permanently evacuated, permanently sealed Ignitrons. One 200-kw., 275-volt equipment and three 300-kw., 275-volt equipments have been placed in service at the date of reading this paper.

The principal advantages of the rectifier are, of course, high momentary overload capacity and high efficiency, and these advantages have, in many cases, combined to make the rectifier the most economical conversion unit.

In a typical example of concentrated mechanical mining, a substation is located adjacent to the load center and serves several operating units, each unit consisting of a cutter, a loader and a locomotive. These machines are powered by intermittent, or short-time-rated, motors, which have continuous ratings averaging about one-third of the nominal ratings. A substation to serve this group of machines should have sufficient continuous capacity to furnish all the power that the machines can safely absorb on an all-day basis. The substation also should have sufficient momentary capacity to carry over the normal peak load without damage to the conversion unit or interruption of the supply of d.c. power. Experience has indicated that this peak frequently approaches the sum of the combined rated currents of all the machines served.

For example, a substation serving six units, having a total of approximately 960 hp., should be capable of carrying 900 kw. momentarily and 300 kw. continuously. Interpreted in terms of conversion units, this means a 300-kw. rectifier will operate with fewer outages than a 400-kw. rotating machine, since the 300-kw. rectifier unit can carry more load momentarily than the 400-kw. rotating unit.

At 275 volts, there will be but a minor difference in the cost of the substation, including building, foundation and installation, whether a rotating machine or a rectifier is used, and at 600 volts the rectifier will definitely be less expensive. Any saving in operating cost obtained by the use of the rectifier will be a net gain.

Basing a power-cost comparison on 275-volt equipment only, the losses of a 300-kw. rectifier will average 5 kw.-hr. per hour less than the losses of a rotary converter over the usual load cycle, and will average 20 kw.-hr. less than the losses of a synchronous motor-generator. In a mine in which power must be kept on the trolley continuously to operate pumps and other auxiliary services, the annual saving in comparison with a rotary converter will be roughly 40,000 kw.-hr., which, at 1¢ per kw.-hr., is $400. The comparison with a motor-generator shows a saving of 160,000 kw.-hr., or $16,000 per year. The savings in 600-volt service are more impressive, since, on the higher voltage, the rectifier efficiency is increased approximately 3 per cent, while the efficiencies of 275- and 600-volt rotating machines are approximately the same.

As of this date, six Ignitron rectifiers have each had more than one year of service, the maximum in this group being 32 months and the average 22 months. Nine additional Ignitron rectifiers have had less than one year each, the maximum in this group being nine months and the average six months. In the six equipments of the first group, there are 36 Ignitron fanks, 36 excitation Thyratrons, 36 Ignitor crystals, 6 vacuum pumping systems and 6 cooling systems. These are the parts which were really on trial in the earlier installations.

Maintenance Cost Low

No delays have been caused by leaks in the vacuum system and only one shutdown has been caused by any type of failure of the vacuum system. This was caused by improper operation, contrary to instructions. When the mercury was replenished in the mercury-vapor pump and attention was called to the proper method of operation, the trouble was cured permanently. Four Ignitor crystals have been replaced in the field. Two of these were defective crystals which failed very soon after installation. Two others, which were replaced after approximately one year of service, were not returned to the fac-

tory for inspection, so the exact condition of these crystals at the time of reported failure is unknown.

The minimum life of firing tubes has been slightly more than twelve months. Some firing tubes have been in service two years, but the average is at least fifteen to eighteen months. Only four of the Ignitron tanks have been opened, all for replacement of firing crystals. No other internal parts have been replaced or repaired.

There have been no recent failures of the cooling system. In several of the earlier installations, it was necessary to modify the circulating-water pumps to prevent loss of water and to improve bearings. These modifications have, apparently, eliminated the trouble. Under present conditions, the amount of water required to replenish losses is negligible.

It seems evident, therefore, that Ignitron rectifiers, at the present stage of their development, are highly reliable, comparing favorably with rotating machines. The cost of maintenance is extremely low except for the cost of replacing firing tubes, which, judging from existing experience, should average less than $150 per year. In comparison with rotating conversion machines, the over-all cost of maintenance of rectifiers usually will be higher, but the difference should not exceed $100 per year on the smaller ratings. On the larger ratings, maintenance costs will be more nearly equal.

In an analysis of power conditions at a mine, due consideration should be given to the effect of added equipment on the power-factor of the system. A rectifier, with its transformer, operates at an average power-factor of approximately 93 per cent. A rotary converter usually is adjusted to operate at unity power-factor at the average load, but, as an all-day average, usually will operate at something less than unity, lagging. Standard mining motor-generator sets are capable of producing a large corrective effect to compensate for inductive equipment on the system. A power-factor analysis can be made only with a full knowledge of local conditions and any further attempt to make a definite statement on this subject would be useless.

As a result of three years' experience in the application and operation of rectifiers in coal-mining service, combined with many years of experience in other industries, we can summarize as follows:

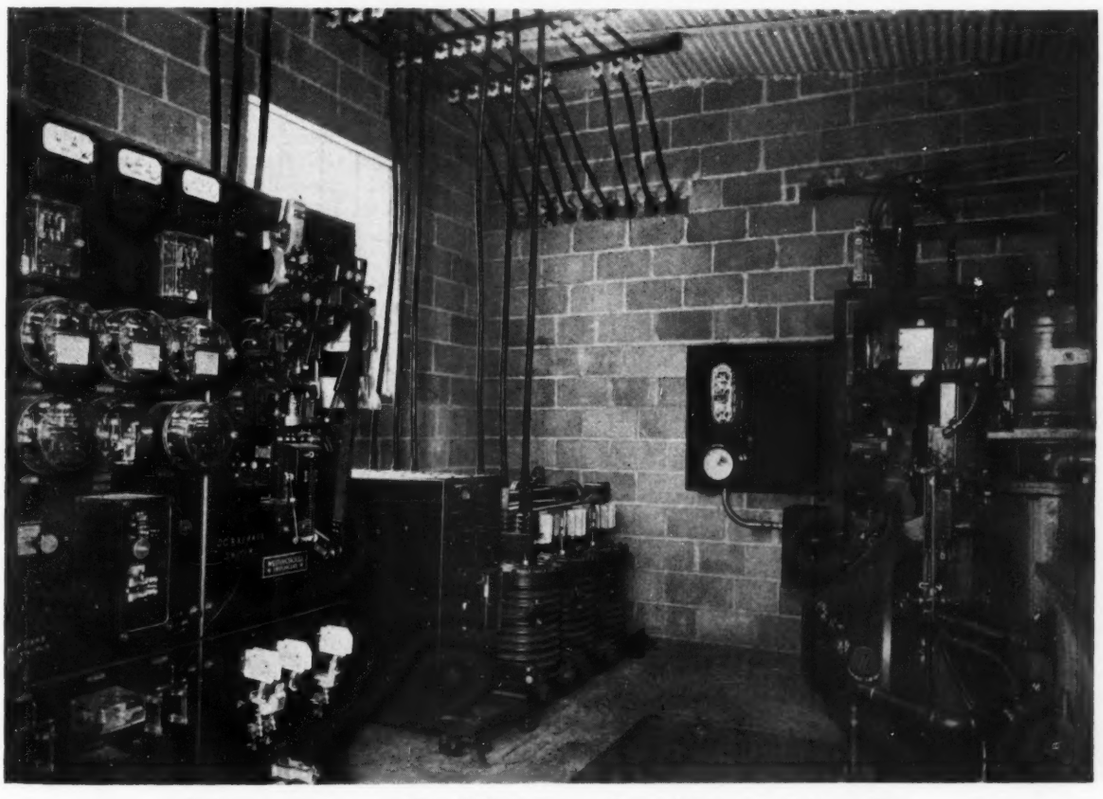
1. Rectifiers are at least equal to other types of conversion equipment in reliability.

2. For equipments of equal service capacity for mining conditions, the installed cost of a rectifier will be approximately equal to or less than the cost of rotating conversion equipment.

3. The operating cost of a rectifier, including maintenance and cost of power, will be less than the operating cost of rotating machines, except where power-factor correction is of considerable importance.

4. Where additional power-factor corrective equipment is necessary, a motor-generator, or a rectifier with capacitors, may be the preferred type of equipment.

5. An analysis of local conditions, taking into account required service capacity, hours of service per year, power-cost rates and power-factor, is necessary to establish which type of conversion equipment is most advantageous.



Ignitron mercury-arc rectifier (400 kw.) in surface substation at Robinson Run No. 2 mine, Christopher Mining Co.

[FIRST OF A SERIES OF ARTICLES ON VENTILATION FOR FOREMEN AND OTHERS]

HOW A FOREMAN CAN INCREASE + Quantity of Air in Circulation And Lower Resistance of Workings

AT EVERY mine the ventilating current should be a matter of constant study, for conditions are changing day by day. The foreman, during days when the mine is idle, profitably can make ventilation a matter for his careful investigation. No time is better, for, when no men are working in the mine, he safely can ascertain the effect of changing splits or of increasing or decreasing the opening in regulators.

Many of these problems are not as simple as one would expect, and actual test always is better than theorizing. Using one's anemometer is better than using one's judgment or one's too-often faulty mathematics. With men in the mine, tests are dangerous, for the experimenter may guess wrong, and there are other reasons why idle-day studies are desirable.

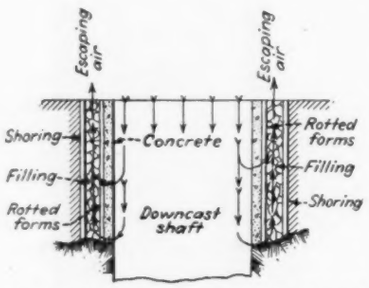


Fig. 1—Showing escape of air through shaft lining with blowing fan.

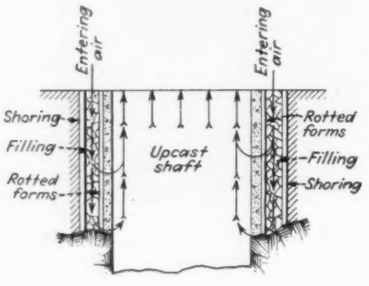


Fig. 2—Leakage through shaft lining with exhaust fan.

Wherever differences of pressure are greatest, there ventilation losses are likely to be heaviest. In just such places the foreman should be alert to prevent losses, for there they can be combated with the greatest degree of success, because, as a rule, any work done to prevent them will be effective for a long time, sometimes as long as the mine will operate, so that what money is expended may give permanent improvement and may continue to render dividends as long as the mine is in production. Hence, where losses are heaviest, they also are often of longest duration unless action is taken against them.

As the fan is locally the source of a great difference in air pressure, most careful observations should be made near the fan. Leakage in a steel fan drift should be carefully hunted and stopped with suitable elastic compound, especially at doors, but many foremen who would suspect a leakage in such places would be little disposed to anticipate leakage just inside the mine near the fan drift.

Foremen are inclined to believe that all the trouble underground must come from a leakage between intake and return airways, and that where there are no return airways there can be no leakage. However, there is near the mine mouth, be it shaft, slope or drift, another kind of leakage which in some unfortunate cases may reach 24 or 40 per cent of the entire air current.

The foreman should recall that when the shaft was excavated, if the approach is by a shaft, the dimensions of the excavation were much greater than those of the present airway and that the excess space usually was filled in part by concrete, wood forms, pounded rock and somewhat loose dirt filling. Caving during excavation may have made this excess space quite large.

Unless conditions were such that water was likely to enter in quantity through the lining, no one, in all probability, realized that the shaft lining should be tight. As the shaft collar usually is above the level of the natural ground, leakage of surface water into the shaft is not much to be feared, for the water runs the other way. But though water may not enter, air will leak in or out

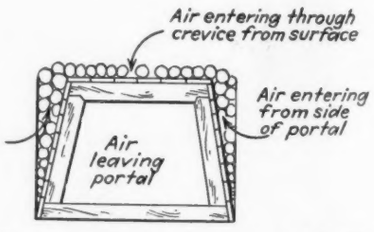


Fig. 3—Leakage around slope portal with exhaust fan.

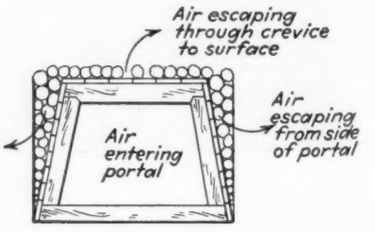


Fig. 4—Leakage around slope portal with blowing fan.

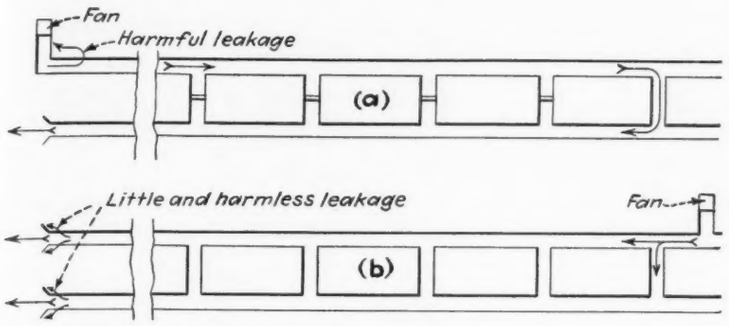


Fig. 5—Showing how fan location influences the importance of air leakage around the portal.

readily, for the wood used either for shoring or as forms soon cracks and rots, and the filling rarely is tight.

Air travels through the cracked, dried and rotted wood, through the broken stone or loosened filling, or even through crevices in the concrete, traveling out of the shaft into the back of the lining, escaping especially where the concrete makes an incomplete joint with the rock (see Fig. 1).* With a pressure fan, some of the air which should enter the mine will pass through such a crevice, up through the open space around the concrete lining, and out to the surface. Although the resistance per foot is not great, the air has to travel so far through the mine (sometimes five or more miles) that it welcomes a chance to leave by a course measured by only a few feet. The opening may not be large but the distance is so short that escape through it is inviting. Such escaping air, which has had to be put under the full mine pressure, has burdened the fan as much as that which travels to the face, and it does absolutely no good.

In a drift or a slope leading to a fan, whether suction or exhaust, are many opportunities for leakage. Sometimes the portal is concreted, but rarely does the concrete fill the entire space (see Figs. 3 and 4). As a rule, there is forepoling or at least timbering, and the job of sealing is not even attempted. The overburden falls down on the rotting timber, and crevices occur to the surface.

Any difference in pressure is reflected in a severe leak which may appear some hundred or more feet underground or be distributed over a long distance; so long, indeed, that the losses per foot are small and remain undiscovered. In a mine, economy is more important than appearance, and a tight portal for the fanway is more desirable than a pretentious portal for the roadway or manway. This is not always realized.

So long as the fan is near the portal, the tightness of that opening is a matter of moment—see Fig. 5 *(a)*. Sometimes the fan later is moved away to a distance or a new fan is erected at some remote spot. In that case, the tightness of the original approach to the surface ceases to have any significance, for then the air which enters or leaves by crevices will travel in or out in the same direction as the entering or leaving main current—see Fig. 5 *(b)*.

In a shaft it is difficult to test for the tightness of the lining. Even in a fan drift or slope such a test may be almost impossible, for sometimes the air may travel too fast to permit of a test being made for leakage. Hence, it may be advisable to choose for the investigation some day when the mine is idle and the speed of the fan can be decreased, especially if the investigation is to be made with an open light.

If the air to be investigated is an intake or, being a return, is definitely non-gassy, tests of the conditions of shaft, drift or slope are made sometimes with an open-flame lamp which will give its best indications in case of air being under pressure, not suction, but care must be taken not to ignite timber, and leakage to the surface only must be investigated with the light, not leakage to any return, for the return may be definitely explosive and, if the flame is drawn through into the return, the current may be ignited. Dry wood is likely to catch fire if the flame test is used, and only the tightness of wet timber can be tested with safety by a flame.

If the mine is not gassy but is lighted by electric lamps, the return air should be tested frequently with a safety lamp during such an examination with an open light. In a gassy mine, the open light cannot be used, and one way of testing for such leaks is by holding a short length of thread, extremely flexible paper or some chicken down at a point where leakage is suspected. The paper, thread, or down will be deflected by the air current, but these are not very sensitive indicators of leakage and are useful only when much air is being wasted.

If soapy water were spread over a leaky wall, the surface would be covered with large bubbles on the low-pressure side. A miscible oil or glycerine would give the bubbles greater coherence. In a shaft, water from a hose could be held by ditching around the collar so that it could escape only immediately around the shaft lining if it escaped at all, and if it thus entered, the entrance of air under dry conditions would be certain, but the water might go to some other place or enter the shaft so far down that it could not be distinguished from the usual subsurface shaft water.

Sometimes a shaft is used for both the intake and return airway, and in such cases important leakage between the two sides of the shaft is almost inevitable, but such leakage, if tested by a lamp on the intake, may drive or draw the flame into the return, possibly with disastrous consequences. Such shafts cannot be too strongly condemned. An explosion would wreck the partition and with it the entire ventilating system.

Furthermore, there is the disad-

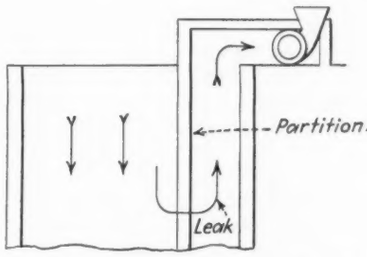


Fig. 6—Leakage through curtain wall with exhaust fan.

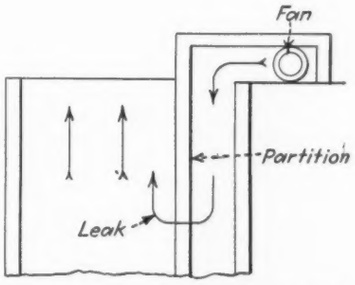


Fig. 7—Leakage through curtain wall with blowing fan.

* In drawings, when arrows have tail feathers, they designate legitimate circulation. If they have no tail feathers and are solid, they designate leakage. Arrows with broken lines serve merely to connect names with things represented.

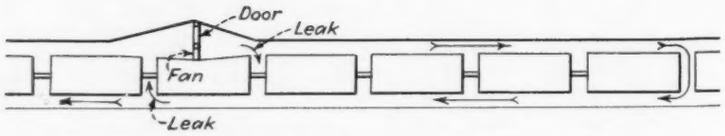


Fig. 8—Showing how leakage results in recirculation of air by booster fan.

vantage that the leaks between one side and the other will give the fan useless air to move. There will be no recirculation of foul air or methane due to leakage of the curtain wall; in fact only intake air will be drawn in, but there will be less air passing through the mine. Hence, it is important to test such walls, and if they are found to leak they should be tightened and strengthened (see Figs. 6 and 7).

As stated, leakage is to be feared wherever differences of water gage are great. This will occur not only when fans are outside or near the outside of the mine but when they are used for boosting the air current and are placed a long way within the mine. It will be assumed that the booster is a force fan, located on a roadway that is an intake, which is usual practice. Booster fans are not desirable, but they are used only too frequently. If the stoppings which are outby a booster fan should leak, the booster will draw air from the return and recirculate it. Such a fan circulation will be better than no circulation at all, but if it recirculates enough times, and the mine is gassy, the methane will soon exceed safe limits (see Fig. 8).

Stoppings may leak badly inby the fan, the air traveling in the opposite direction to that leaking outby the fan, for the inby air is under pressure, whereas the outby air was under suction. However, the leakage will not be so severe if the stoppings are equally well constructed, for the pressure differences usually will be less, and this leakage will not cause recirculation. It will, however, cause a loss of air at the face. It is important to watch stoppings near a booster, especially to the outby when the workings to the inby are short, and also to watch the door by which men pass the booster. This latter not only wastes air but may be left open, rendering the fan of little value.

NEW SHAFT BOTTOM

Quadruples Output at Hazleton

By R. DAWSON HALL
Engineering Editor, Coal Age

• Prompt action at the bottom of the shaft and use of all four of its compartments for hoisting turned a 1,200-ton-per-day mine into one producing 4,500 tons without increasing running time. Some said it couldn't be done, but the Lehigh Valley Coal Co. proved that it could, justifying the mine development that went along with shaft sinking and use of mechanical loading equipment. A car-transfer truck, car feeders, trip makers and automatic cagers make the cars cage and decage with unbelievable celerity. Room for 45 loads and 45 empties on one side and 68 loads and 68 empties on the other—all in rock tunnel—and the use of a distant runaround track to feed cars where needed have put new life into an old mine.

IN CAGING and decaging of cars, quick action is needed if, without working extra shifts, a 1,200-ton-per-day mine is to be converted into one producing 4,500 tons. This radical change has been effected at the Hazleton mine of the Lehigh Valley Coal Co., at Hazleton, Pa. However, it should be said that two compartments of the shaft now are being used for the transportation of coal that originally were provided for the hoisting of water. Cars of 105 cu.ft. capacity are raised one at a time, and the lift to the surface from the lowest level—the Third—is 488.9 ft. A car-transfer truck, two car feeders, two automatic trip makers and four automatic cagers turn the trick.

In the two compartments on the west side of the shaft, where the long tanks used to pass up with their loads of mine water, the cages that have replaced them stop only at the Third Landing; no provision has been made at the other levels for bringing cars to that side of the shaft. On the east side, the cages service cars also at the Second and First Landings, just as before the changes were made. For these reasons, the frequency with which cages arrive at the Third Landing on the east side is restricted, yet normally they should take care of about half the coal of the mine—namely, all that coming from the north side. To obtain the utmost flexibility, provision has been made by which the north- or south-side trips can be routed around to the opposing side through a rock tunnel 1,100 ft. east of the shaft. Thus, the coal originating on either the north or the south side can be hoisted on either the east or west side of the shaft.

Cars approaching the shaft from the north side pass alternately to one of a pair of cages on the west side of the shaft, being directed automatically by a switch to the cage which will present itself next for their individual transportation. They are caged automatically when the cage arrives at the level of the landing with its empty car.

A transfer truck awaits this empty when it is pushed off the cage by the incoming load. Actuated either automatically or through a pushbutton (both methods are available), the transfer truck travels under its own power to the extreme western

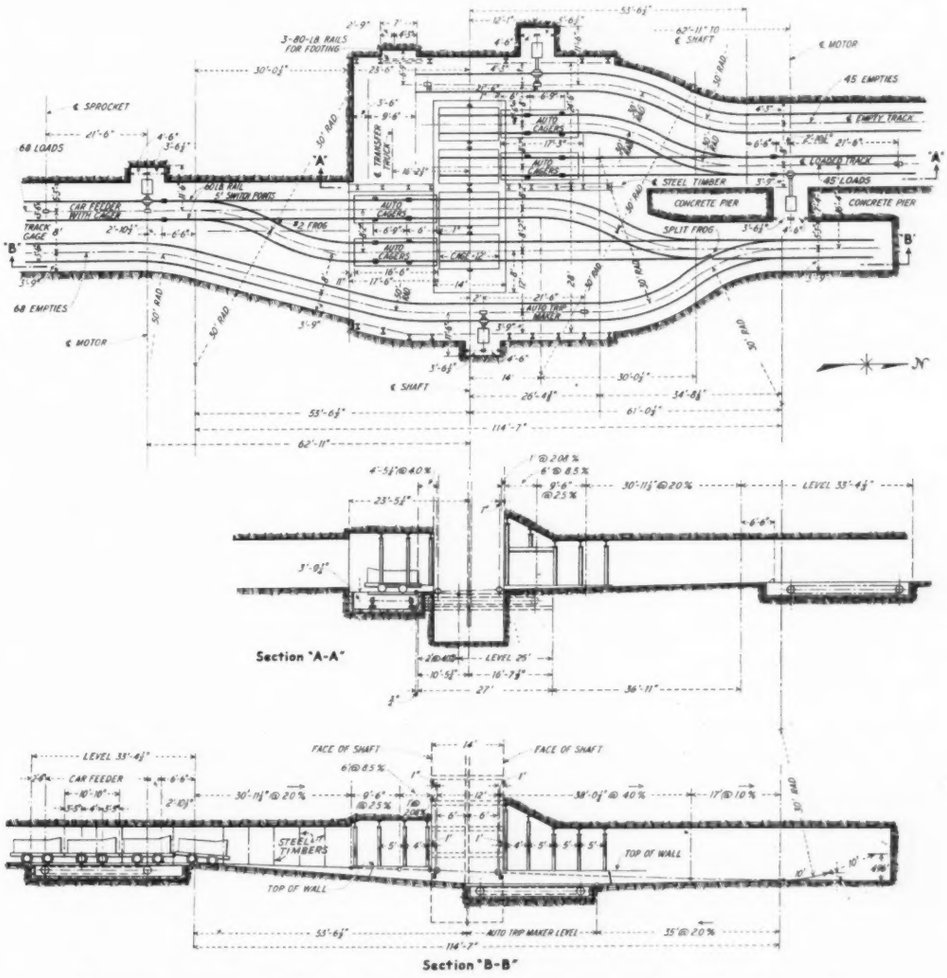
end of the shaft, where it stops opposite the end of an empty-car track. Here the empty car is discharged automatically from the transfer track to the empty-car track, and an automatic trip maker arranges for its coupling by hand. An automatic car feeder further along the road moves the trip thus made along a track with a capacity for holding 45 cars. The loaded track has an equal capacity.

Preference was shown for a transfer track because facing the empty side of the west end of the shaft much coal had been removed and a saddle made the measures uncertain and unmanageable, causing it to be difficult for a kick-back switch to be arranged. To have hand-switched the cars would have been difficult and slow, whereas the power transfer is accomplished rapidly and without effort.

When the button is pushed with the transfer truck at the end of the empty-car track, the truck does not return to the point where it got its last empty car but goes to the other of the pair of cages, where an empty car will next be ready for decaging. When it is self-controlled it will do the same, but always after receiving an empty car it carries it unerringly to the end of the empty track. But, if the operative wants the transfer truck to stop in line with the same cage twice in succession, he can control its movements so as to obtain his end.

Cars approaching from the south are accommodated on a 68-car turnout. These cars are advanced by a car feeder and are loaded alternately automatically to one of a pair of cages on the east side of the shaft. The empties pushed off the cages by these loads pass to a kick-back and a switch and are lined on a track around the east side of the shaft where they are coupled with the aid of an automatic trip maker on a track which also will hold a string of 68 cars. All the automatic cagers are of Nolan type and the car transfer, car feeders and trip makers were supplied by Roberts & Schaefer. A 5-hp. motor energizes the transfer truck; the feeders and trip makers are furnished with 15-hp. motors.

Coal is hoisted on the east side of the shaft by a 30x48-in. Vulcan hoist and on the west side by the old water hoist, a 29x60-in. Vulcan unit; both are first-motion steam units. As the coal pitches on the average 34 deg., loading mechanization in general is not necessary. However, some shakers and chain conveyors recently have been installed where the occurrence of saddles created more nearly level areas in which the coal is too level to be worked successfully without the assistance of suitable loading equipment.



Plan and cross-section of Hazleton main bottom. An automatic car transfer on the west side takes care of coal cars approaching from the north. The east side has a kick-back switch. Though the roof is unusually strong, heavy girders span the wider openings.

SAFE ELECTRIC BLASTING

+ Attained by Close Observance Of Some Simple Rules

By P. C. ZIEMKE

THE introduction of electricity into the art of blasting is the most important development in recent years. Success with this method has been made possible by perfecting instantaneous and delay electric caps with their assurance of firing all the holes instantaneously, or in rotation with definite periods between rounds.

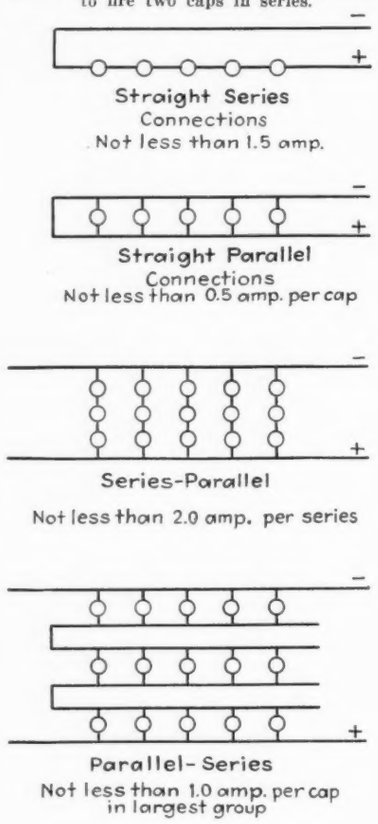
In shooting with fuse and caps, the possibility is presented that holes do not fire in the desired rotation, as holes frequently are cut off by the adjacent shots, which result in blast failures. Or, as frequently happens in underground work, so much smoke is produced from the fuse that some are not even seen and therefore are not ignited by the blaster.

Safety Factors Considered

One factor that makes for greater certainty of rotative electric blasting as compared with fuse is found in the fact that the burning speed of fuse is greatly affected by pressure. When tamping is accomplished with considerable force, the tamping material often exerts such pressure on the fuse that it will fail to burn properly. The modern all-metal detonator is immune to such excessive tamping pressures.

Another great advantage in using the electric delay detonator is that it can be placed in the bottom of the hole without danger of igniting the charge. Also, should the collar be inadvertently blown off by a preceding hole, the damaged hole will still fire, usually with good results. For shaft and tunnel work, electric blasting has advantages unobtainable with fuse firing. Greater safety for the men is made possible, as well as the elimination of much fuse smoke. All too frequently primary power has failed on hoists at the most critical moment, leaving men caught in the shaft with fuses lighted. In tunnel blasting everyone can be accounted for, and in a safe place, before power is applied to the lead-in wires.

Blasting circuit connections.
An increase of 20 per cent in current over that required for a single cap is necessary to fire two caps in series.



When, in tunnels and shafts, only a blasting machine is available for firing, electric detonators must be connected in series, because the current output necessarily must be of high voltage and low amperage to overcome the additional resistance of detonators when placed in series. However, never use the detonators of two manufacturers in the same series because the resistance values may vary greatly and result in the low-resistance detonators firing first and ruining the circuit.

Blasting from Power Circuit

When power is available there is practically no advantage in employing the series circuit, although two exceptions may be mentioned: (1) That greater speed in connecting is possible, and (2) that a final check with the galvanometer will indicate a complete or open circuit. Both these advantages are more than offset in the parallel circuit, since odd resistance values in different brands of detonators are of no concern, each one drawing instantaneous and sufficient current from its connection directly to the lead wire. Even though some leakage may be present, due to abrasion from the charging stick or other faulty insulation of the detonator leg wires, sufficient current is still available to fire all detonators.

Care in connecting in parallel can be exercised by first gathering one leg wire of all the shots in one common group, gathering all the remaining leg wires in a second group, and then counting the number of wires in each group to insure that none has been overlooked. Another worth-while precaution is to use detonators with each leg wire colored—say, white or black—then to group all wires of one color eliminates the error of connecting both paired leg wires to one group. On large shots, installing two bare copper "bus" wires on dry wooden pegs greatly facilitates the operation of connecting up the shot.

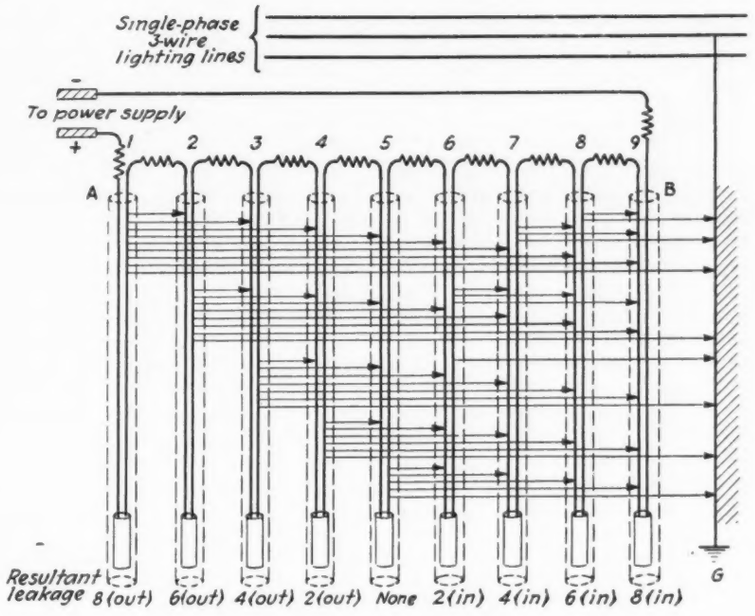
To avoid trouble in firing electrically, it is necessary for the successful blaster to become familiar with elementary electrical principles. Usually these troubles are readily traced to three causes, which are: insufficient current, ground leakage, and uneven distribution of current. Whenever electric caps fail to fire but are exploded by a second application of current, the trouble was purely electrical and the difficulty usually can be found within the causes above outlined.

An electric cap requires about half an ampere of current at half a volt to properly heat the bridge filaments sufficiently to ignite the priming charge. Electric caps connected in series must have at least 1½ amp. per series, and two volts allowed per cap.

Series Circuit Leakages

Trouble from uneven current distribution frequently occurs in firing series circuits, since with each cap added we increase the ohmic (electrical) resistance and thereby cause the current to seek other paths of conductivity around the cap circuit, there being no such thing as a perfectly insulated blasting circuit. Referring to the accompanying diagram, as the current enters the series some leakage is apparent. This leakage in or out of the circuit at any point is the result of voltage differences or electrical pressure between different points of the shot-firing circuit. Obviously, all leakage from the first hole is from the circuit and all the leakage at the last hole is into the circuit.

At all of the other holes the tendency to leak is partly into and partly out of the circuit. Under such circumstances it is obvious that not all the caps will receive sufficient current to simultaneously heat all the bridge filaments to exploding temperatures, and a misfire results.



Theoretical leakage paths from a series connection.

It is an established fact that the bridge filament does not rupture by fusing but by the priming-charge explosion. The sensitive explosive of the detonator is ignited at temperatures much below the fusing temperature of the wire filament.

Thus we find that when detonators are series-connected, the flow of current ceases the instant one bridge wire opens. The time period between the application of the firing current and the opening of the series circuit, by the breaking of one or more of the detonator bridge wires, depends upon the strength of the current flowing in the wire circuit and the sensitiveness of the detonators to the current. Detonators, as heretofore mentioned, must be of new stock and all of the same manufacture to insure uniform sensitivity.

Portable blasting machines of either hand- or spring-operated type producing current at rated capacities have a current output varying from 1.4 to 0.8 amp. over a discharge-time interval of 0.02 second. This factor varies with the resistance value of the detonators, their leg wires, and the lead wires.

Assuming that all factors involved tend to create series circuits of relatively high resistance, the average current discharge of a machine is approximately 0.8 amp. It is readily apparent that even a small leakage of current from a series circuit, or marked differences in sensitiveness of detonators, tends to cause serious differences in firing time.

Regardless of the source of current employed in a firing circuit of detonators, the current flowing through it is determined by the sum total of the resistance. Therefore, all of the current that enters one end of the circuit must emerge at

Safe Practices

Store explosives in proper magazines; use new stock.

Never use detonators of different manufacturers in a series circuit.

Make wire connections clean, tight, and well insulated.

Avoid using ordinary detonators in wet work. Use waterproof brands, and see that no electrical leaks develop.

Provide current of ample capacity to properly supply all detonators.

Use a rheostat to test your blasting machine for current output.

Use only series connections with blasting machines.

Operate machines with maximum force at all times.

Avoid chafing detonator wires by careless tamping or by stepping on them.

Use the galvanometer to detect ground leakage, open or short circuits, unbalanced series-parallel circuits, wrong connections, and on individual detonators.

Use only the best lead wire and new connecting wire; second-rate materials cause expensive delays and blast failures.

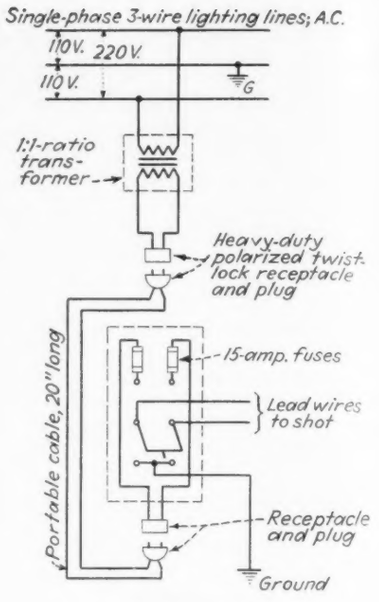
At least one man must devote his time to checking thoroughly for missed connections, wrong connections, delay detonators in wrong holes, bare or crossed connections, and danger from premature explosions by an untimely application of current or sneak current.

the other terminal, which is accomplished only if the source of supply is ungrounded and good electrical insulation is provided.

With alternating current coming into general use in blasting operations, some consideration must be given to its adaptation to shotfiring. Electrical codes require grounding one phase of practically all low-voltage lighting and power circuits. When current from this grounded source is used as a firing medium, there are two difficulties: (1) as applied to a series circuit of questionable insulated value, some of the current bypasses or shunts around various detonators, as previously explained, and (2) the most noticeable and serious difficulty is the fact that much of the current leaves the detonator circuit at innumerable points of faulty insulation and does not reenter the circuit but flows through the earth to the ground rod at the source of supply.

A ready means of maintaining the required grounding of light and power circuits and yet furnish a source of ungrounded current for blasting is to use a small compact 1-to-1 ratio transformer, preferably of the dry type. A transformer of from 3 to 10 K.U.A. size, depending on the firing current required, is coupled to either lighting or power mains where uninterrupted current is available. Then, supplied with ungrounded power of ample proportions and using caution to keep the detonator circuit free from electrical leaks, we may be assured of passing sufficient current through the circuit to achieve 100 per cent detonation.

A very necessary adjunct to the art of blasting by power is the special blasting switch. This switch is of the double-pole double-throw type, usually furnished oversize to insure mechanical strength for hard use. The switch is mounted in a metal or wooden cabinet with the lid so arranged that a baffle on its inner side prevents closing and locking if the switch is in the "up," or firing, position. The switch blades must be in the "down," or grounded, position to permit closing and locking the lid. Grounding the switch against the possibility of sneak currents flowing about the project is accomplished by strapping together the lower switch clips and connecting them to an effective ground. An added precaution and refinement is the "sweating" of a bit of copper strap into the upper switch clips so that the switch blades cannot be held in the firing position by friction, but only by the force of the blaster's hand. Forgetting the switch in the firing position while the blaster goes back to check the cause of a blast failure is thus prevented.



Blasting switch.

Another precaution is that of terminating the source of power outside of the switch box in a service receptacle, with a second receptacle placed either inside the switch box or on the outer and bottom side. By this means the switch can be supplied with power only by means of a short cable, the possession of which, in combination with the key, is retained by the blaster in charge.

Blasting by electricity is successfully accomplished only when the best materials and equipment are available. One essential part of the equipment is the galvanometer. Without it one cannot know whether the circuit is complete or open, or if leakage is present in sufficient degree to cause a misfire. The purpose of the galvanometer is to indicate whether a blasting circuit is opened or closed, and, if closed, whether the circuit is in proper condition for firing or not. The galvanometer may be used in testing individual caps and also groups of caps or detonators wired and ready for firing.

In general, before testing a circuit the galvanometer should be checked to see if the cell is in good condition. This test can be made by placing a short piece of copper

across the two binding posts of the instrument. Under this test the needle should swing clear across the scale. If the needle does not move at all, the cell is dead. If it goes only partly across the scale, the cell is nearly exhausted and should be replaced.

Chloride-of-silver cells have been selected after many years of experimental work as the best for blasting work. The use of other cell types may give a current of sufficient strength to go through a blasting cap and fire it. Chloride-of-silver cells also give practically full voltage until exhausted, when the voltage suddenly drops. For this reason no method of adjusting battery voltage is required, as would be the case when other types of cells are used.

Series Circuit Testing

To test the condition of a group of caps connected in series and ready for firing, first calculate the total resistance of the caps and add to it the resistance of the lead wires used. The resistance of caps may be obtained from tables issued by the explosives manufacturers. Copper lead wire resistance in ohms per 1,000 ft. is as follows: No. 8 Brown & Sharpe gage, 0.6271 ohm; No. 10 Brown & Sharpe gage, 0.9972 ohm; No. 12 Brown & Sharpe gage, 1.586 ohms; No. 14 Brown & Sharpe gage, 2.521 ohms; No. 16 Brown & Sharpe gage, 4.009 ohms; No. 18 Brown & Sharpe gage, 6.374 ohms; No. 20 Brown & Sharpe gage, 10.14 ohms; No. 21 Brown & Sharpe gage, 12.78 ohms; No. 22 Brown & Sharpe gage, 16.12 ohms.

For example, if 30 blasting caps were used together with 100 ft. of No. 20 connecting wire and 500 ft. of No. 16 lead wire, the total resistance of the circuit would be figured as follows: assuming the caps in question have a resistance of 2 ohms, as given in the manufacturers's table, then 30 caps have a resistance of 60 ohms; 100 ft. No. 20 wire has a resistance of 1 ohm, 500 ft. No. 16 wire has a resistance of 2 ohms, and total resistance of the circuit is 63 ohms. With the galvanometer applied to ends of the circuit, the needle should indicate approximately 63 ohms. In circuits where the caps are connected in parallel, each cap must be tested separately. In circuits where parallel-series arrangement is used the circuit must be separated into individual groups and each series tested by itself.

To locate a break in a series of caps, separate the ends of the lead wires and check the resistance of each group of caps until the open one is discovered. It is almost unnecessary to state that the galvanometer, though rugged in construction, requires care and attention by its user. All too often it is carelessly thrown about and subjected to rough handling. Such treatment can result only in a short life of the instrument and grossly inaccurate and misleading readings. An inaccurate watch is practically useless; so too is an abused galvanometer.

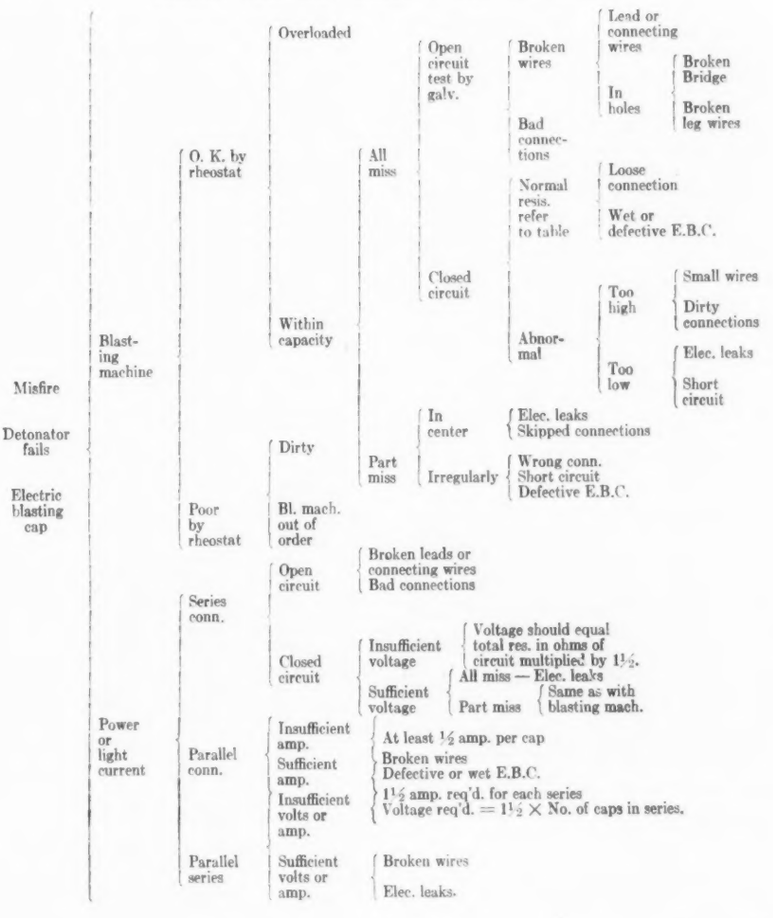
Accompanying this article is a chart containing all the factors that may cause a blast failure or misfire. At first glance what originally appeared to be a very simple process of connecting and firing a blast can develop into a perplexing problem when failure occurs.

Assuming for the moment that we are confronted with the task of determining the cause of a misfire, beginning at the left, we find that a detonator or several detonators have failed. Since we are using a blasting machine in this instance, we check its condition with a rheostat. The test proves that this machine is delivering current at full-rated capacity and, proceeding, we find the maximum number of detonators permitted was not exceeded and the center detonators are the ones which failed to fire. The conclusion then is that we missed some connections or, as frequently occurs, the insulation is faulty and the current has bypassed.

As a second problem, let us assume that power is used for blasting. Starting from that point on the chart, we find the parallel connection was used, and the conclusion reached is that in this case an insufficient amperage was available, which resulted in only the most sensitive detonators receiving the required current of ½ amp.

Altogether too many accidents are the result of hasty, slipshod methods that appear to be acceptable because no serious accident has yet been experienced. Speed, accuracy and painstaking care can be exercised in blasting operations if each individual is thoroughly instructed in his duties and no task is left undone by the assumption that the other fellow has attended to the job.

Factors That May Cause a Blast or Misfire



HARD-COAL BURNING QUALITIES

+ Do Electrical Conductivity Tests Offer a Better Basis for Estimation?

By CLARK C. LUCE

Glen Ridge, N. J.

THE burning characteristics of anthracite coal can be determined by actually burning it in a furnace. But, because of the large number of variables which made laboratory burning tests rather unsatisfactory, the industry has either accepted the customers' evaluation of the burning characteristics or assumed that the difference was immaterial. Why the consumer is not complacent about it is explained by actual tests. Nicolls and Landry[1] have shown that there may be a difference of 25 per cent in the rate of heat evolution at a given draft with two different coals. This is borne out by the experience of industrial plants. To the householder it may represent the difference between a house temperature of 56 or 70 deg. in zero weather. Nicolls and Landry also showed a difference of 450 per cent in the rate of pick-up from a banked fire with two different coals.

The principal indices of the burning characteristics of anthracite have been volatile matter and specific gravity. Unfortunately, the volatile matter varies considerably in a single mine, the Bureau of Mines having found a variation of as much as 3.5 per cent.[2] Considering that this is as great a variation as between the average coals from Carbondale and Coaldale, misleading conclusions often might be drawn. While the isovols of Turner[2] are accurate in defining the regions of slow- and fast-burning coal, these lines no doubt are based on the average of the seams at the particular points where the samples were taken. In the case of a commercial sample there is no easy way to find out how closely it represents a complete cross-section of the seams that might have existed at the mining point had there been no erosion. As an example, a comparison between two collieries in Middle Western Field is given below:

Colliery	Principal Seams
A	Mammoth
B	Buck Mt. } Lykens }

The upper seams have been eroded at Colliery B so that the actual volatile matter is below the average of the district. With the district known, the two coals can readily be identified as Mahanoy and Shamokin from the conductivity.

The specific gravity, although affected by the volatile matter, also is used as an index of ash content. It can hardly be more accurate than the volatile matter and ash when used as a burning index.

If two pieces of anthracite are successively placed between two contact points and the electrical conductivity is determined, it will be found that the conductivity of the fast-burning piece is much lower than that of the slow-burning piece provided they are both equally wet or dry and their ash content is such as to identify them as coal. If samples now are taken from different places and the points from which coal of equal conductivity is obtained are connected on the map, the lines will follow in a general way the isovols of Turner; that is, they also will define the regions of slow- and fast-burning coal.

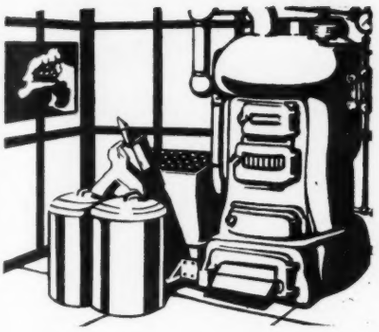
Per Cent Volatile Matter		
Actual	Map	Conductivity
4.6	4	Max.
5.3	8	Min.

In the tests, the instrument used classified the coal into four groups with the dividing lines at 7,500 ohms, 100,000 ohms and 1 megohm with an applied voltage of 110. Four divisions were considered to be as many as would be identified by most consumers, although subdivisions are possible if further work indicates their desirability. The tests were run on individual pieces, which may seem tedious but is quicker than quartering and crushing, even if several hundred small pieces are tested.

Samples were taken from several fields, the collieries being located in

[1] Transactions of the Second Anthracite Conference at Lehigh University, 1939, p. 20.

[2] H. G. Turner: "Anthracites and Semi-Anthracites of Pennsylvania." Trans. A.I.M.E. (1934), Vol. 108, 330-344.



or near Shamokin, Carbondale, Scranton, Wilkes-Barre, Pottsville, Shenandoah, Hazleton and Coaldale. The results were in accordance with the Turner map in the general order as given. Samples then were checked for specific gravity and ash. The "harder" coal indicated that perhaps a conductivity measurement and a sink-and-float test might be enough for the estimation of ash, but the complete range of coals gave disappointing results. No doubt the reason was a fortunate selection of samples.

Samples were then taken from all the seams in two collieries in two different regions. Those from the same colliery showed about the same conductivity regardless of seam. This accounted for the erratic results in the sink-and-float test. The variation in volatile matter found by Hill applied also to specific gravity but not to conductivity. We thus have a characteristic of anthracite that, like the burning characteristic, is a question of region. The relation between them is so much closer than with volatile matter or specific gravity, and is so much more easily determined, that it seems the best method of estimating burning characteristics yet developed short of actual burning tests.

The explanation of the conductivity of anthracite probably lies in its content of elemental carbon. This in turn is only partly dependent on the hydrogen and volatile matter content. The difference in the density of compounds of the same hydrogen content no doubt accounts for the variation in the density of anthracite having the same conductivity.

Explaining the relationship between burning characteristics and conductivity is more difficult. The specific gravity of graphite is 2.25, that of anthracite around 1.6. If heat causes decomposition of anthracite and the formation of minute particles of graphite, as indicated by conductivity data,[3] the increase in specific gravity with no change in apparent density must mean the formation of a large number of very small fissures. If homogeneous, the fissures might extend through the piece of coal. With a mixture of graphite, however, the fissures would tend to terminate at the graphite particles, which are undergoing no change in specific gravity. The average fissure length, therefore, would approximate the average distance between graphite particles. As the reaction velocity of anthracite is dependent on the area exposed, and this in turn is dependent on the number and depth of fissures, it is but a short step to the conclusion that there is a relationship between the reactivity of anthracite as shown in a furnace and the quantity of graphite shown by electrical conductivity.

Assuming that further tests confirm the data already obtained, the conductivity method is useful in a number of ways. In furnace tests, stove or chestnut usually is selected as being best adapted to the furnace. With the conductivity method, any size can be tested with the same apparatus. The particle size makes very little difference in the reading.

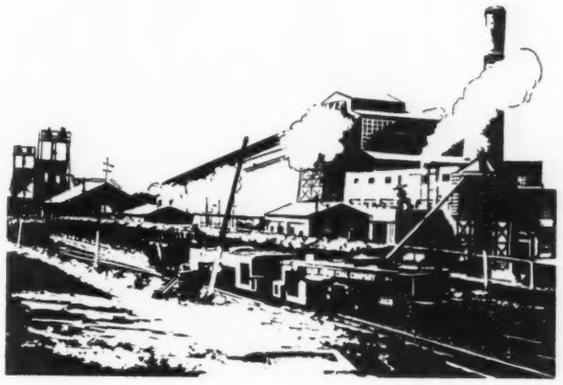
Mixtures also can be identified. It is most difficult to distinguish by any other means the difference between the usual colliery blend and a mixture of coals of similar fracture but unlike burning characteristics, which often causes trouble by the ash from the fast-burning coal being clinkered by the slower burning coal.

Not only does mixing often produce clinkering but it also affects sampling. With a large quantity of coal, unless it can be sampled from a chute, it is difficult to tell if the sample is representative. The probability of error is much greater in the case of mixtures than if the coal is all of the same general type. A preliminary test of conductivity would indicate how homogeneous the coal is, the location of different types, if present, and, under favorable conditions, the comparative quantities of each type. It should then be possible to take an accurate sample for chemical analysis.

Conductivity can be used to determine the burning characteristics of buckwheat and rice as a guide in adjusting the air damper on stokers. To save the consumer from having to test his coal, apparatus has been designed to adjust automatically the air damper with changes in coal. In the automatic adjustment the apparatus takes care of differences not only in type of coal but also in size and wetness.

The possibilities of using conductivity in anthracite preparation requires further study. Where, because of the location of the points of extraction or because of the caprice of nature, coal going into a breaker varies widely, conductivity might indicate the correct jig or cone setting from time to time or might be used to effect a separation to increase the efficiency of the cleaning apparatus. As has been pointed out, conductivity may or may not give an indication of density.

[3] Eric Sinkinson and Jerome Ganz: *Ind. Eng. Chem.*, Vol. 30, p. 1419; 1938.



IF WIRE ROPE COULD ONLY *talk*...

Ordinary Wire Rope: "Don't you ever get tired?"
Macwhyte PREformed: "Naw. You see I come from a long line of famous strong back ropes, Macwhyte's the name. Being lubricated practically for life with a special lubricant, we Macwhytes have terrific resistance to internal friction and fatigue. Then, too, we're made of the finest steels."

Ordinary Wire Rope: "Oh-h-h, my back's about to break! I've been running in circles over sheaves and drums all day long. Oh-h-h . . ."
Macwhyte PREformed: "Buck up fella, you'll get over it. Where you working?"

Ordinary Wire Rope: "Gee, I'll bet you fellows live long, too."
Macwhyte PREformed: "Yes, we're pretty well known for our long life. You see at the factory before they let us go, we get a chiropractic adjustment and a thorough examination. Once they say OK to us, we're ready for a long life of heavy duty."

Ordinary Wire Rope: "On that shovel. Started this morning, and I'm all worn out. Say, you look like you never worked or worried. How do you do it?"
Macwhyte PREformed: "Me? Say, I work plenty, pal . . . been working on that job next to you for weeks. Night shifts, too. And I feel fine."

Ordinary Wire Rope: "What d'ya mean, chiropractic adjustment?"
Macwhyte PREformed: "That means 'made into perfect PREformed Macwhyte Wire Rope.' And believe me, brother, I earn money for the fellow who buys me...I'm built to take it."

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Mine Examination and Valuation, by C. H. Baxter and R. D. Parks. Michigan College of Mining and Technology, Houghton, Mich. 331 pp., 5x7½ in.; leather. Price, $3.50.

This book, a second edition, limits itself strictly to valuation of the mine as a mineral proposition. It says little or nothing about plant or depreciation. Michigan and mine valuation have been synonymous terms, and these two authors hark from the Michigan College of Mining and Technology. Within its limitations it is authoritative and, having a number of valuable tables on the value of $1 and $1 per year in *n* years at several rates per cent, present values of an annuity of $1 per year for *n* years at certain rates per cent, compound interest, and six other tables, it will be found helpful in determining present land values.

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Lubricants and Lubrication, by James I. Clower, associate professor of machine design, Virginia Polytechnic Institute; formerly technical editor, Vacuum Oil Co. McGraw-Hill Book Co. 453 pp., 6x9¼ in.; cloth. Price, $5.

This book is written essentially from a practical viewpoint. The first eleven chapters cover the fundamentals of lubricants and lubrication for all types of machinery and industry. The next five chapters treat in detail the lubrication of steam turbines, steam engines, air compressors, refrigerating machines and all types of internal-combustion engines. Principles and practices outlined in the earlier chapters are here applied to specific machines. Storage and handling of lubricants and proper supervision and keeping of records are the themes of the concluding chapter. An appendix contains table and charts for making volume and gravity corrections and viscosity-index determinations.

Crude petroleum is covered from the time of Abraham, with origin, location, production, classification and composition (including structural formulas). The chapters on petroleum refining and products describe the various processes and products classed according to refining process and commercial uses. Fixed oils and fats are covered in a short but complete discussion, as also are solid lubricants (graphite, mica, etc.). Greases are analyzed from their manufacture to their physical, chemical and material tests. Lubricating-oil tests are explained in detail for chemical, physical and material differences. The chapter entitled "fundamentals of lubrication" clearly tells the physics of lubrication and of oil grooves in bearings. Design, selection, installation and maintenance of lubricating appliances and systems for both oils and greases are the subject of another chapter.

The subject matter is written in a clear, understandable style. Of great importance is the abundance of photographs and detailed drawings, making each subject easily grasped. The book may serve as either a handbook or textbook, especially for the practical man.—C. H. L.

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A Washability Study of the Woodstock Coal Bed at Klondyke Mine, West Blocton, Ala., by B. W. Gandrud and G. D. Coe, U. S. Bureau of Mines. R. I. 3419; 24 pp.; mimeograph.

Cahaba field coals have good coking properties but are not used for coke making. Bone is more prevalent in the fine sizes than in the coarse, so it has not been found possible to wash the fine sizes to as low an ash content as the coarse. The high-ash bone in many of the mines is extensive in the form of thin flakes which cannot readily be depressed in washing. The authors conclude the minus 3-in. coal can be washed to about 4.4 per cent ash with efficiency.

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The Performance of Several Types of Bituminous Coal on Small Underfeed Stokers, by H. R. Limbacher and Ralph A. Sherman. Bituminous Coal Research. 45 pp., mimeograph. Price, 20c.

Particularly valuable in this report is the reference to the use of agitators to prevent the formation of coke trees, which are effective even when burning Upper Freeport coal, which is said to be so strongly coking that it burns with great difficulty on the conventional small stoker. The agitator makes it possible to maintain a thinner coal bed without interfering with efficiency of combustion. Thus, the clinker is more readily removed.

With coals having a marked tendency to smoke, some smoke was formed during "on" periods of operation, when the agitator lifted the fuel bed, in contrast to the almost smokeless operation of the conventional stoker at such periods. Contrariwise, as with the agitator, the fuel bed was thin and the smoke was reduced markedly during "off" operation. Lifting the top of the fuel by the agitator increased the quantity of fly-ash but shortened the time required to operate the stoker, thus saving coal, and the thin fuel bed made the fire pick up promptly. "Hold-fire" periods necessary to maintain a fire varied from 3.6 minutes per hour for High Splint coal to 6.5 minutes per hour for ¼x1¼-in. Indiana No. 6 coal.

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Carbonizing Properties and Petrographic Composition of Pittsburgh-Bed Coal From Bureau of Mines Experimental Mine, Bruceton, Allegheny County, Pa., by A. C. Fieldner and others. U. S. Bureau of Mines, Technical Paper 594, 43 pp.; paper. Price, 10c.

Petrographic studies and agglutinating, plastic, chemical and carbonization tests of the Bruceton coal with shatter, tumbling and sizing tests of the coke and chemical tests of coke, gas and tar are included in this booklet with studies of the blending of this coal with that from Beckley, W. Va. The top 14-in. layer is 38 per cent anthraxylon and 60 attritus, but the bottom 49 in. is 71 per cent anthraxylon and 26 attritus. In each instance, the rest is fusain.

At a charge density of 54.3 lb. per cubic foot, the coal shrinks 17.5 per cent under a load of 2.2 lb. per square inch. Hence, the Bruceton coal can be mixed safely with a highly expansive coal. Sulphur in the coal is 2.4 per cent, but, when the coal is mixed with 20 and 30 per cent of that from Beckley, falls to 1.1 and 1.0 per cent respectively in the coke. On the other hand, largely because of loss of volatile matter in coking, the ash content rises from 7.8 per cent to 9.9 and 9.1 respectively.

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Some Instruments and Devices That Coal-Mine Officials Should Understand and Use, by G. W. Grove, U. S. Bureau of Mines. I. C. 7037; 11 pp., mimeograph.

An elementary publication on the water gage, anemometer, mercuric, aneroid and recording barometers, psychrometer, flame safety lamp, lamp-testing box, and detectors for methane, carbon monoxide and hydrogen sulphide.

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The Agglomerating Index of Coal, by J. F. Barkley and L. R. Burdick, U. S. Bureau of Mines. R. I. 3424, 8 pp.; paper; mimeograph.

This bulletin is less about the agglomerating index than about its use in classifying coals and about the indexes of several coals. A small quantity of coal is heated in a container to about 950 deg. C. (1,742 deg. F.) in a reducing atmosphere, so that it cakes or cokes if susceptible to such action. Coke that will support a 500-gram weight without pulverizing or that forms a button which shows swelling or cell structure is said to be agglomerating.

An anthracite, a semi-anthracite, two sub-bituminous coals and a lignite all gave a non-coherent residue. Two semi-anthracites, one high-volatile B and one sub-bituminous B, while not giving a non-coherent residue, showed no swelling or cell structure, and the three buttons, after careful removal from the crucible, crushed to powder when 500 grams was carefully lowered on them.

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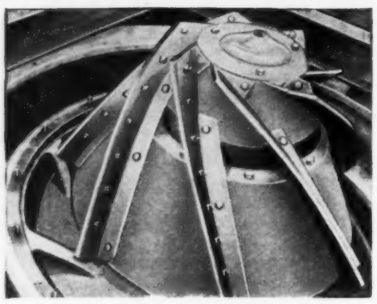
CONTINUOUS CENTRIFUGALS 500 TIMES GRAVITY TRADE MARK

ELMORE CONTINUOUS CENTRIFUGAL DRYER

View showing screen basket being superimposed on inner core.



View showing inner cone with flights

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1. As easy to operate as an ordinary electric motor—save time and labor.
2. In all comparisons made, the maintenance cost per ton of material processed is much lower for the ELMORE. Requiries no heat.
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5. Makes it possible to reclaim sludge and turn it into a salable product at low cost.
6. Gives you more tonnage while keeping costs down.

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The centrifuge was placed in operation the latter part of December 1937, and through which we passed the fine coal recovered from the fine coal recovery tank mixing this product with the oversize up to 1" and although we did not complete the installation of the heat drying unit until the latter part of March we had no further trouble from freezing on the shipments moving into the Northwest. The fine coal ranging into sizes between ⅛" and 48 mesh carried sufficient moisture after passing over the wedge wire in our conveyors to freeze solidly in the cars, however, after passing through the centrifuge the surface moisture on this fine coal was reduced to less than 6% and this product mixed in the regular manner was sufficiently dry to prevent freezing.

When submitting our ideas to the ..... for completed preparation plant we put the problem up to them to dry our fine coal sufficiently to prevent freezing and to permit the extension of our trade territory into the Northwest where temperatures are extremely low in the winter season. The drying installation recommended by the ..... is quite an elaborate and complete one and consequently expensive. I do not hesitate to state that if I had known at the time of placing this contract as much about the results that we could reasonably expect from the operation of the above mentioned centrifuge that we could have saved a very considerable capital investment by installing two of the Elmore centrifugal dryers instead of the plant which we now have. The saving would not only be considerable in capital investment, but would be a continuous daily operating saving after being installed as these units operate with very little attention. We would have been able to save one man's time as well as the coal consumed in operating heat drying unit and very substantial low power costs.

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OPERATING IDEAS

From

Production, Electrical and Mechanical Men

Crusher Built in Bin Outlet Breaks Coal to Size

Lack of space and a desire to save expense animated F. D. Lambert, general manager, Shawmut Mining Co., St. Mary's, Pa., in installing, between two adjustable pedestals, a single-roll crusher for reducing all the coal from Procter No. 1 mine, at Force, Pa., to suitable size. Coal enters the roll from a 6-ton bin. Reciprocating plate feeder pushes the coal ahead to a point where the spikes on the crusher can tear it to pieces and push it on to the chute beyond.

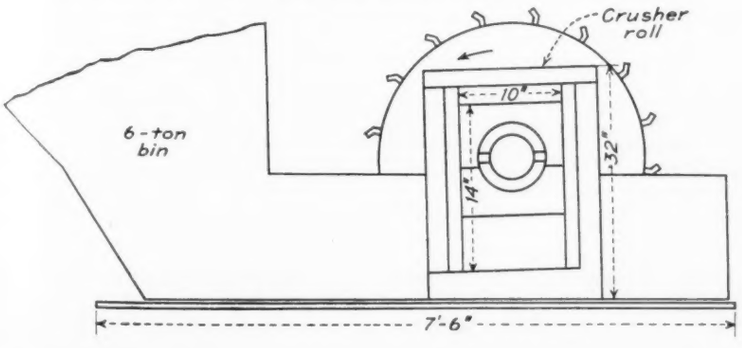
The crusher consists of a spider 18 in. in diameter wrapped around with a plate of ½-in. steel in which are welded in diamond shape, 5 in. apart, hexagonal steel spikes 4½ in. long with their ends turned slightly at the point as in a mining-machine bit. Resting in boxes 10 in. wide and 14 in. high, the shaft of the crusher can be moved up or down by a chain block, for the boxes are free to travel in a vertical direction in 32-in. slides bolted to the side of the chute and secured to the roof timbers by steel rods.

When the crusher is established at the proper height, wooden blocks are inserted under the shaft boxes to hold them and it in position. If material too hard for the crusher to handle passes under it, the latter is raised thereby to drop back after the material has passed. During over two years of operation only two picks have been knocked out. This happened soon after the crusher was installed and appears to indicate that the crusher was faultily set rather than wrongly planned or designed.

Length of the roll is 41½ in. and the unit will handle 200 tons per hour. Weight of the crusher, shaft, boxes and slides is 1,800 lb. Perhaps it is too heavy, but the management prefers to err in that direction. The crusher is driven by a 20-hp. motor through a 24-in. sprocket and revolves 96 times in a minute.

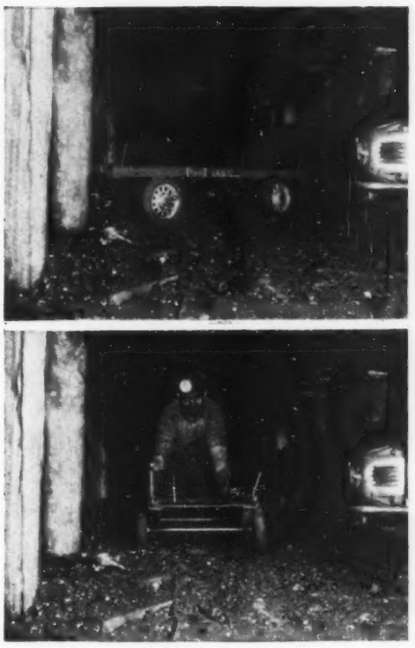
No longer is the market for large-size coal active; all the coal at this mine is reduced to nut and smaller. Had a regular crusher installation been made, more headroom or lateral space would have had to be provided and more equipment would have been necessary. As the tipple was already built and operating, such drastic reconstruction was not desirable.

This crusher, set between adjustable pedestals, is built in the bin outlet.



Rubber-Tired Supply Wagons Used With Conveyors

Describing the development of rubber-tired supply wagons for use in conveyor sections, N. L. Sefton, engineer, Logan County Coal Corporation, points out that reversing the direction of the chain units to move supplies from the room necks to the faces was the first method to be adopted at the Lundale (W. Va.) mine of the company; this in 1931. By use of the conveyors, posts, caps, wedges and drag chains were taken to the face. Pans for conveyor extension were moved by the two members of the crew designated as supply men, who usually dragged them along on the floor. All supplies were taken up at the start of the shift and it was necessary that the conveyors be emptied of coal at the end of each shift so that the men on the succeeding shift would be able to take their supplies to the face on their way up. This usually required 20 to 25 minutes for each conveyor face in a 47-in. seam.



Sketch of mine-door fastener made from ⅜-in. flat strap iron.

During the latter part of 1937, the conveyor section in the 47-in. seam worked out and the conveyors were moved to a section of the mine where the seam averaged only 37 in. The conveyors, many sections of which had been in use since 1931, were showing signs of wear and the chains on being reversed sometimes caught on the end of the guide rails and pans and broke, causing considerable delay and loss of tonnage.

In January, 1939, the first supply wagon, shown in the accompanying illustrations, was built from a discarded 6x1½-ft. guide-rail section, two 7/16-in. axles, seven pieces of 1¼x¼x16-in. bar iron, and four 2x10-in. single-tube pneumatic-tired wheels. With this wagon, one man hauls supplies to two conveyor faces each shift in from 30 minutes (when the conveyors are starting new rooms) to 3 hours (when the faces are 600 ft. apart). After

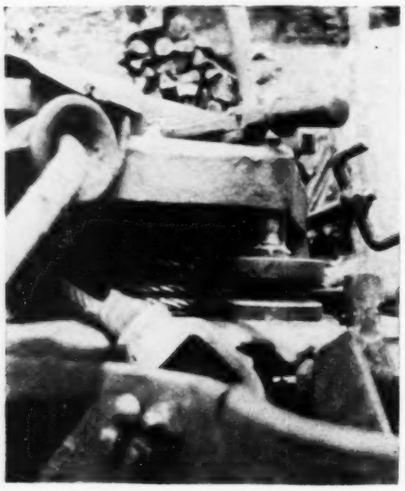
supplying both places the supply man goes to the face as a loader for the remainder of the shift. His absence from the face during the supply period usually loses about 3 or 4 cars, which means from 8 to 11 tons of coal, but the loss of tonnage by broken conveyor chains, which greatly exceeded that amount, was eliminated. By use of the wagon, all supplies are hauled to the faces with ease while production continues at a normal rate.

During a move of the mother conveyor a new man overloaded the wagon, causing the valve stem to be torn from the tube. Some difficulty was encountered in replacing the stem, so it was decided to use solid-rubber tires, purchasing the wheels from the Fairbanks Co., Pittsburgh, and increase the axle diameter to $\frac{3}{4}$ in. on all succeeding wagons. Although motor armatures are moved on the wagon from the low-coal section to the haulage track, no overload difficulties have occurred "and we feel that considerable time and expense has been saved and the supply handling problem licked."

Converting Shortwall Machine From Chain to Rope Feed

A popular make cutting machine of the older type uses a $\frac{3}{4}$-in. log chain 40 ft. long for feeding the machine in and pulling it across the face. This had obvious disadvantages with respect to safety, production and maintenance. A heavy sumping bar or pan was used for sumping in and the rear of the machine, while cutting, was held by a ratchet and stand which takes up slack on the tail end chain. Such heavy, cumbersome equipment was difficult to operate, requiring excessive time and labor. It was unsafe, men often being struck by the ratchet handle when taking up slack. Excessive wear of either drive sprocket or chain permits the chain to slip, resulting in a tremendous strain on the clutch and gears, causing frequent breakdowns.

Fig. 1—Feed drum replaces chain sprocket.



Newer machines use wire rope, but many of the older types are yet in service.

At a comparatively small cost, F. Fraser MacWilliams tells how, at the Keystone Coal Co.'s Mooween (Pa.) mine, Frank Tuzi, electrician, has developed a means of applying both feed and tail ropes to the machines with resultant gains in efficiency and safety. A feed drum replaces the chain sprocket, as shown in Fig. 1, and is easily installed at the same location. A tail-rope drum is mounted as shown in Fig. 2, and is controlled by a brake operated from the rear. Using this arrangement, the heavy chain is replaced by a rope and all movements of the machine are controlled from the rear, resulting in added safety and ease of operation. The double sheave at the tail rope socket (Fig. 2) permits the ropes to be reversed for sumping-in. The three other idler chain-sprockets are replaced by standard rope-sheaves. Cost of a complete set of parts for the change is $125.00 and they can be installed in a few hours by any mine mechanic. As a result of the change, the same crew is now cutting four places in the time formerly required to cut three, which is a nice increase in production for a comparatively small investment.

Fig. 2—Location of tail-rope drum and brake.

Coverage

The world contains more knowledge than any man can hope to acquire, or use if he could acquire it. So the problem becomes one of limiting coverage to those things which will be most useful in daily life. A certain body of general knowledge is essential to well-rounded performance, but in a man's specific task the coverage should be as complete as possible if he is to meet the unexpected and come through with flying colors. This department is designed to help operating, electrical, mechanical and safety men around the mines to increase their ability to do their job. Naturally, it is a cooperative task—you send in the ideas and we print 'em. So if you have an idea for making life happier around the works, here is the place for it. Send a sketch or photo if it will help to make it clearer. For each acceptable idea, Coal Age pays $5 or more.

Faith Plus Horse Sense the Best Guide In Selecting Insulating Varnishes

INSULATING varnish is placed in electrical equipment to prevent moisture and dirt from getting in, declares L. E. Miller, design engineer, Reliance Electric & Mfg. Co., in a paper delivered earlier this year to the meeting of the Preston County Miners' Association, Silver Lake, Md. The varnish also serves a number of additional purposes, including tightening and binding the electric windings into a solid, impervious unit-acting mass; increasing the ability of the windings to pass off heat; raising dielectric strength; and providing a smooth, hard coating over the windings to improve appearance, make it more difficult for dirt and dust to collect and facilitate cleaning.

Varnishes are of the air-drying or baking types. Air-drying varnishes in turn may be divided into two general classes: spirit varnishes (usually resin in alcohol) and naphtha varnishes (resins, gums and asphalts in coal-tar or petroleum naphtha). In addition, many air-drying varnishes make use of synthetic resins in higher alcohols, ethers or coal-tar naphtha. A quite useful example is the so-called glyptal type. "Air-drying varnishes are in general not satisfactory for the impregnation of coils," as "the characteristics of the baking varnishes are so much better and the life is so much greater" that the former should be used only as a temporary expedient.

"Baking varnishes supply the backbone of motor protection." In general, these are composed of resins (natural or synthetic), drying oils (of which linseed and chinawood oils are most common) and solvents (mainly coal-tar or petroleum naphthas). Incidentally, the proper solvents always should be used in thinning varnishes for best results. Another increasingly important varnish substance is the liquid obtained from the shell of the cashew nut. Varnishes made from this substance do not dry by oxidation, as in the case of the conventional varnishes, but rather by condensation and polymerization somewhat like the synthetic-resin varnishes.

Selection of a varnish requires consideration of three major factors: (1) the characteristics which it is desired the varnish should impart; (2) the application for which the motor is intended; and (3) the service conditions. Coal mines, as a rule, offer rather severe load

Installing Exide-Ironclads is like flattening out the grades in a mine

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There are many reasons why this is so. Exide-Ironclads have exceptionally high power ability—they can deliver a great surge of power when needed, which makes light work of unusual loads and grades. They maintain a good voltage all through a working shift, keeping the speed of the haulage service consistently good, hour after hour. They keep out of trouble and cut delays to a minimum.

In addition, you pay no premium for this superior service. Exide-Ironclads last so long and cost so little to maintain that they keep haulage costs low. These facts go far to explain why Exide-Ironclads are the most widely used batteries in storage battery locomotive service today. Write for free booklet, "The Storage Battery Locomotive for Underground Haulage."

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and service conditions. And it would seem that a varnish should meet reasonably well all the requirements of these various conditions. "This is where we strike the first snag in making our selection," as, for example, one varnish may be good on oil resistance but poor for water, or good for both but poor on life, and so on. "It is obvious that there is no value in selecting a varnish that may be good or even excellent in two of these features if it is poor in the third."

Weighting the desirable characteristics should be the first step in selecting a varnish. In this connection, "I would assign the arbitrary values of: life, 28; water resistance, 23; oil resistance, 23; draining, 9; drying time, 9; and dry dielectric, 8. Dry dielectric is placed so low because if the varnish is satisfactory from the other standpoints "it will be sufficiently high in dry dielectric."

Having determined the desired characteristics and having weighted them properly, "the user then is faced with the selection of a particular commercial varnish that will give these results." The usual procedure, which might be called the "faith method," is to approach a reputable varnish company and accept its recommendations. But the Reliance company, Mr. Miller pointed out, found that manufacturers, even though agreeing that a better varnish was obtainable, could not get together on just what this varnish was.

"This is where the faith method of selection received a severe strain." As a result, Reliance decided on a series of exhaustive tests, which were conducted on unlabeled samples with only key identifying numbers by the laboratories of four varnish companies. In other words, four samples of each varnish were tested in the laboratories of four different companies. The results showed that "some of these varnishes . . . certainly were not suited for the purpose for which they were recommended," even though the recommendations were the honest opinions of reputable manufacturers.

"How, then, can you who have neither the time nor inclination to make such exhaustive tests make sure you are getting a suitable varnish for your purpose? The best advice I can give you is that you still resort to the faith method, but season it with a grain of salt. Further, I feel rather sure that your friends among the motor manufacturers will be glad to advise you regarding the type of varnish they are using in their equipment. This, of course, is not a foolproof method, but when you consider that they are interested in seeing that their motors have a good service record and, further, that they have no ax to grind in selling you varnish, it would seem like a safe procedure."

It should not be concluded from the above, however, that it is satisfactory to use only one kind of a varnish in a motor. "Such is not the case. The varnish that is best for impregnation is not necessarily the best for finish. Furthermore, the varnish that is best for the impregnation of one coil is not necessarily the best for impregnation of other coils." An armature coil, for example, generally is shallow and small in cross-section. A long-oxidizing oil varnish will work very well on a coil of this type. A mixture of chinawood and linseed oils with the proper gums, asphalts or resins, or all, will give a good tough film of considerable life. But if this same varnish is used on shunt-field coils with comparatively large cross-sections, it will be found on baking that the outer portion is well cured but the inside still is raw and wet. This is due to the fact that this type of varnish requires oxygen for proper curing, and curing the outer portion prevents oxygen from getting at the varnish inside. Sooner or later, the oil inside becomes rancid and fatty organic acids tend to set up corrosion.

"For the impregnation of such coils, therefore, we need a non-oxidizing varnish. Such a varnish can be of two kinds—either a resin dissolved in a solvent which sets up by evaporation, or a condensing, or polymerizing, type. Both condensation and polymerization being chemical actions, or changes, caused by the action of heat only, no oxygen is required in curing and, therefore, such a varnish will cure throughout when subjected to heat. Evaporating varnishes have been used, but the point at which they are just right is rather critical. Generally, they are not completely dry or they are too dry and brittle and have a tendency to powder and flake off.

"In impregnating a coil, it always should be preheated before dipping. This not only drives out the moisture but the hot coil, when dipped, decreases the viscosity of the varnish and permits better penetration. In addition, the heat expands the coil and relieves compression and, therefore, permits entrance of the varnish to otherwise inaccessible places. The coil should be allowed to remain in the varnish until bubbling has ceased and for from 10 to 30 minutes afterward. In withdrawing the coil it should be done slowly. Slow withdrawing prevents breaking the film caused by the surface tension of the varnish, and a more uniform deposit is assured.

"Baking temperature depends upon the type of varnish, but generally 250 to 275 deg. F. is a good average. Lower than this unduly delays the curing and higher is dangerous in case the part is left in the oven after the cure is completed. Baking time depends upon the varnish used and the size of the part. Oven temperature should be fairly uniform—the coldest and hottest spots not over 25 deg. apart. Good ventilation is necessary, not only to reduce the fire hazard but also to supply the oxygen to cure the drying oil.

"Singeing of coils is one of the methods of preventing water or moisture from penetrating. The small particles, or fibers, of the insulation web have quite a tendency to project through the varnish coat and form wicks through which moisture can penetrate to the inner part of the coil. Singeing removes these fibers from both cotton and glass.

"Overcuring of varnish does less damage than undercuring. In overcuring, some of the life is taken away from the varnish but the results of this are a long way off, whereas undercuring permits the formation of organic acids which show up in trouble in a comparatively short time. When it is a question of whether sufficient varnish is used it always is best to err on the side of using too much. Varnish and then more varnish may be expensive but it spells safety." Summarizing, the problem of good insulation boils down to "Get good varnish, use plenty of it, apply it properly, bake it thoroughly and then give the motor periodic inspection of the right sort." Following this plan will greatly reduce electrical troubles and expense.

Connectors Kept Off Ground By Cable-Splicing Rack

For use in connecting 5,000-volt cables either on the spoil bank or on the high wall, Lyman Ellrick, chief electrician, Hickory Grove Coal Mining Corporation, Sullivan, Ind., calls attention to the cable-splicing rack shown in the accompanying illustration. The ends of each wire are fitted with Miller connectors, while the ground from one cable length to the other is fitted with lug-type terminals at each end of the rack for quick and easy disconnecting. The object of the rack is to

The rack keeps the connectors up out of mud and water.

6 YEARS ON THE SAME OIL ...LESS THAN 8% MAKE-UP

● THAT means 6 years to date, without ever removing even part of the oil from the turbine. No "sweetening." No batch treatment. No messy job of cleaning any part of the lubricating system.

Manager Kern of the Peru Municipal Light Plant where this record is being made, has used Standard Oil turbine oils for 25 years. He states that no conventional turbine oil he has used has given the cost-reducing performance of Nonpareil. His 5000 KW turbine generates about 16 million KWH per year; yet he has only used 35 gallons of make-up oil in 6 years.

Figure what you would have saved in turbine operating costs for the past 6 years with this life-time* oil. Fill in your cost figures on the following items:

Cost of oil replacements for:	$_____
Oil changes	_____
Oil lost in treating	_____
Oil lost in cleaning	_____
Oil withdrawn for sweetening	_____
Labor charges for:	$_____
Cleaning oil coolers	_____
Cleaning oil system	$_____
TOTAL	

Nonpareil eliminates every one of those items of expense. Over a period of years, this means an actual money-saving in most plants, plus complete freedom from lubricating worries.

A Standard Lubrication Engineer will be glad to help you make this actual cost comparison. You can reach one of these Engineers through your local Standard Oil (Indiana) office, or by writing 910 South Michigan Avenue, Chicago, Illinois.

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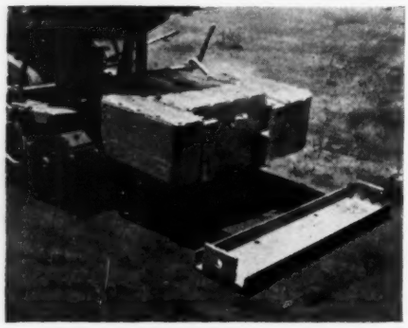
keep the connectors out of water and mud, preventing current leakage and burning. It was made from an old crate and about eighteen ½-in. bolts. Time required was about three hours.

Special Bumper on Loader Aids Handling in Shaft

Because the standard rear bumper on the Joy 8-BU loader was not considered adaptable to chaining the loader under cages for handling it in shafts, the Consolidated Coal Co., operating mines in Illinois, uses a special steel-plate replacement for this purpose. This plate-type



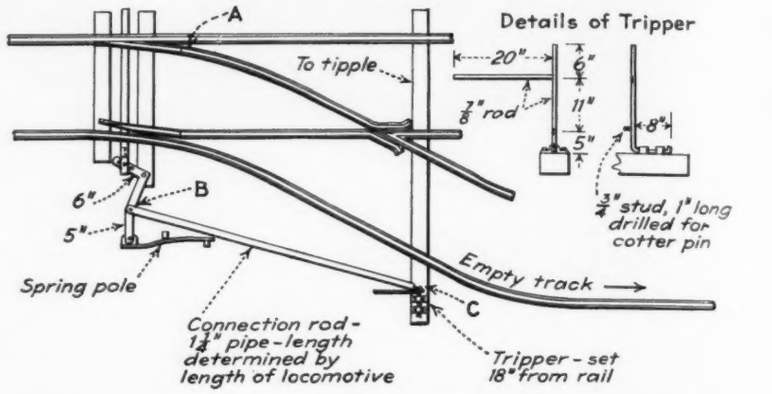
Showing the steel replacement bumper used for handling the loader in a shaft.

unit is shown in the accompanying illustration. To install it, the regular bumper is removed and the replacement unit is bolted on, using the holes for the regular bumper.

Switch Thrown From Locomotive By Use of Special Tripper

Describing it as a simple device with positive pressure on the switches at all times, John Gross, chief electrician, Ohio Block Coal Co., New Philadelphia, Ohio, submits the switchthrower shown in the accompanying illustration, which can be operated by a lever on the locomotive. Furthermore, says Mr. Gross, the thrower permit attachment to a tie and to the concan be made of scrap materials found arm also is made of ⅜x1¼-in. stock. The in the elbow and at the opposite end necting rod and tension arm. The tension flattened at the ends and drilled as necessary for attachment to the toggle member and the tripper. The length of the connecting rod is determined by the length of the locomotive, as will be detailed below.

The tripper consists essentially of an L-shaped member made of ⅞-in. round rod, to which is attached a stud and an arm, also of ¾-in. round, as shown in the illustration. Straps hold the L-member to a tie and permit it to pivot in a vertical plane. The stud is used for attaching the connecting rod. The tripper dimensions given are for the particular installation and, of course, will vary for other



Showing diagrammatically how the switch-thrower is installed and also the details of the tripper.

installations with different conditions. In the installation described by Mr. Gross, the tripper is set 18 in. clear of the track. To determine the length of the connecting rod the rear wheels of the locomotive are set at Point *A*, just ahead of the switch, after which the L-shaped tripper member is raised vertically. The distance between Points *B* and *C* then is the length of the connecting rod. After the position of the contact lever on the locomotive is determined, the arm is fastened on the L-shaped tripper member about 1 in. below the point of contact.

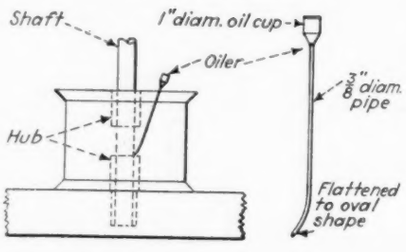
In operation, the motorman, when landing a trip, cuts off the locomotive as he enters the sidetrack and sets the contact lever on the locomotive, which passes over the arm (which is horizontal) and strikes the upright L-member, moving it to the right and, by means of the connecting rod and toggle mechanism, throwing the switches for the straight track. In returning to the main line, the contact lever on the locomotive strikes the arm on the tripper, bringing the L-member back to the vertical position and resetting the switches.

Special Pipe Lubricates Lower Wheel Hub

Mines using rope haulage often have guide wheels mounted on vertical shafts. When these are oiled at the top hub (as most are) the revolving wheel throws off most of the oil so that very little reaches the bottom hub. As the rope rides near the bottom of the wheel, most of the strain is on the bottom hub, so that when poorly lubricated, excessive wear will result. The standard oil can is not made to reach the bottom hub so cannot be used, says Charles W. Watkins, Kingston, Pa., in describing a cheap, home-made oil pipe and its use.

A suitable length of ⅜-in.-diameter oil pipe is slightly bent on one end and flattened to an oval shape. On the other end a small cup, 1 in. in diameter is fastened. By dropping the oiler between the spokes and placing the oval end of the pipe against the shaft and lower hub, oil poured into the cup will lubricate the lower hub. Not only is a better lubrication obtained but less oil is wasted and fewer repairs are required.

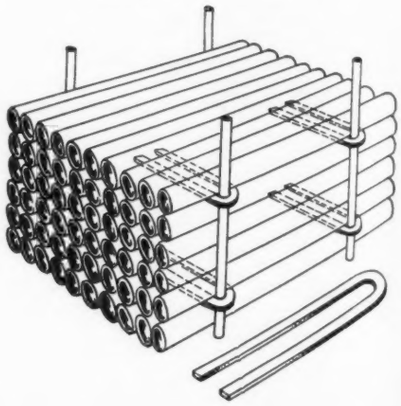
Home-made pipe for oiling bottom hub on vertical shaft wheels.



U-Members Facilitate Piling Tubing or Pipe Materials

Neatness and handiness are combined with economy of space in a method of stacking tubing, pipe or other cylindrical materials, reported by Charles H. Willey, Penacook, N. H. The method is based on the use of U-shaped lengths of flat stock as anchors, which are supplemented by uprights of small pipe or rods placed in the loop ends, as shown in the accompanying illustration.

Showing U-members in use.



WORD FROM THE FIELD

Harlan Labor Indictments Are Dismissed

Indictments against 52 coal companies and individuals in the Harlan County (Kentucky) coal field charged with conspiring to deprive miners of their rights under the Wagner labor relations act were dismissed Oct. 2 in Federal District Court at London, Ky. Acting on the motion of Special U. S. Attorney General Welly K. Hopkins, who said the "rule of the so-called gun thug is no more," Judge H. Church Ford ordered the indictments dismissed. The original indictment was against 69 defendants, but charges were dismissed previously against five companies and four officers; six defendants died and two are in State institutions.

At the trial last year, which lasted eleven weeks, ending Aug. 1 with a hung jury, more than 600 witnesses appeared. According to Mr. Hopkins, disclosures at the trial "led to a decided change for the better." He summarized present conditions thus: "The mines are reopened; the people are at work. A contract is in full force for a two-year period. Arbitration boards are functioning. The militia has been withdrawn. State prosecutions of the miners are no longer pending. Discriminations against the miners and their families have ceased. The right to organize and bargain collectively has been recognized."

Violence Charges Quashed

Charges against more than 400 persons implicated in disturbances in the Harlan field early in the summer were dismissed Sept. 29 in the Harlan Circuit Court. On motion of Commonwealth's Attorney Daniel Boone Smith, Special Judge J. S. Forester ordered the indictments quashed, saying: "The dismissal of these cases is part of an approved settlement worked out by the efforts of high officers of the State, including the Governor and all interested parties, in order to promote industrial peace and to assist all persons affected to live in peace and work together in harmony.

A majority of the indictments arose as a result of the "battle" of Stanfill, on July 12, between National Guardsmen and pickets in which two pickets were killed and five persons, including a National Guard captain, were wounded. Most of those indicted were charged with banding and confederating, among the number being William Turnblazer, president of the Harlan district United Mine Workers, and George Titler, secretary, and his wife.

National Guardsmen were called to Harlan County on May 14 after members of the Harlan County Coal Operators' Association said they would reopen the mines—closed since April 1, when a contract with the U.M.W. expired—without a union contract. The association refused to sign a closed-shop contract. At a meeting in Knoxville, Tenn., on July 19, however, union and association officials signed an agreement which did not contain the closed-shop clause or a strike penalty provision (*Coal Age*, August, p. 60), since which time the mines have been operating practically full time.

Keeping Step With Coal Demand

Bituminous Production

Week Ended	1939 (1,000 Tons)	1938* (1,000 Tons)
September 2	8,080	6,934
September 9	7,676	6,517
September 16	8,944	7,418
September 23	9,200	7,936
September 30	9,994	7,975
October 7	10,175	7,995
October 14	10,430	8,302
Total to October 14	283,517	251,775
Month of September	**37,695**	**32,286**

Anthracite Production

September 2	917	948
September 9	821	516
September 16	1,199	879
September 23	1,344	819
September 30	1,254	921
October 7	1,245	1,143
October 14	1,224	1,185
Total to October 14	40,559	35,865
Month of September	**4,776**	**3,388**

* Outputs of these two columns are for the weeks corresponding to those in 1938, although these weeks do not necessarily end on the same dates.

Bituminous Coal Stocks

	(Thousands of Net Tons) Sept. 1, 1939	Aug. 1, 1939	Sept. 1, 1938
Electric power utilities	7,500	7,002	7,834
Byproduct coke ovens	5,632	4,535	5,540
Steel and rolling mills	534	512	651
Railroads (Class 1)	4,218	4,242	4,556
Other industrials†	9,526	8,374	9,138
Total	27,410	24,665	27,719

Bituminous Coal Consumption

	(Thousands of Net Tons) Aug. 1939	July 1939	Aug. 1938
Electric power utilities	3,842	3,541	3,315
Byproduct coke ovens	5,177	4,748	5,540
Steel and rolling mills	724	665	660
Railroads (Class 1)	6,080	5,903	5,662
Other industrials†	7,624	6,915	7,175
Total	23,447	21,772	20,346

† Includes beehive ovens, coal-gas retorts and cement mills.

Hearing Nears Fourth Month; Price Plan Still Opposed

WASHINGTON, D. C., Oct. 20—With the final hearing on minimum prices under the Bituminous Coal Act about to enter the fourth month, the end is still uncertain. Meantime, proponents of the Committee for Amendment of the Guffey Act continue to give vent to their opposition to the price-fixing scheme. Nevertheless, the taking of testimony began on Oct. 17 on proposals to extend price and marketing regulations to coal produced in the Richmond (Va.) basin.

The Coal Division has set a hearing on an application by Brazil Block Fuels, Inc., Terre Haute, Ind., for provisional approval as a marketing agency. The applicant proposes to act as selling agent for producers of coal transported by rail in the Bituminous Block coal fields in Clay, Vigo, Greene, Owen and Spencer counties, Indiana. Provisional approval has been granted to Upper Buchanan Smokeless Coals, Inc., to act as a marketing agency for coals produced in the Upper Buchanan field of Virginia. C. F. Davis, Fairmont, W. Va., has been selected by the United Mine Workers as its representative on District Board No. 3, vice Frank Miley, deceased; the Coal Division has ratified the change.

Urges Minimum Federal Control

Chester Thompson, former Representative in Congress from Illinois, speaking as a representative of the Committee for Amendment of the Coal Act at the convention of the National Small Business Men's Association at Detroit on Oct. 10, attacked the act. Urging amendment of the act so as to eliminate price fixing, the tax on coal and the 30-day contract-limitation clause, Mr. Thompson asked as a substitute the setting up of marketing agencies under supervision of the Government. This, he said, should provide for a minimum of government control, permitting the industry to extend itself "in every manner, shape and form, in order that it may meet competition and serve the fuel-buying public at reasonable prices commensurate with fair wages and a legitimate return for investment and management."

Price hearings, he thought it safe to predict, would continue for "many more weeks. Minimum prices will not become official until Jan. 1, if then, or if ever."

A petition of the West Kentucky Coal Co., Sturgis, Ky., for review of a finding by the Bituminous Commission that it violated the fair-labor-practices section of the act was dismissed by the Sixth U. S. Court of Appeals in an order filed Oct. 16 in Cincinnati, Ohio. Dismissal was

by stipulation of attorneys for the company and for the Government. A complaint by District 23, United Mine Workers, on Jan. 19 charged that the company failed to accord employees the right to organize and bargain collectively and contended that workers were required to join the "Employees' Mutual Benefit Association," of company origin. As one of its last official acts, the Commission ruled the company guilty on June 28.

Test of the constitutionality of the coal act on appeal by the city of Atlanta, Ga., from a decision of the District of Columbia District Court (*Coal Age*, March, 1939, p. 64) is scheduled to go before the Supreme Court Nov. 6. The Sunshine Anthracite Coal Co., Fort Smith, Ark., has petitioned the Supreme Court to review a decision of the Eighth U. S. Circuit Court of Appeals upholding the former Coal Commission's order decreeing that the company is within the scope of the coal act (*Coal Age*, August, p. 73).

New Preparation Facilities

CONSAGRA COAL CO., Blakely, Pa.: Contract closed with Finch Mfg. Co. for cleaning equipment for new breaker with a feed capacity of 94 tons per hour; equipment to include one 8-ft. Menzies cone separator for stove, chestnut and pea sizes with feed capacity of 70 tons per hour; one 3-ft. Menzies cone separator for buckwheat, with feed capacity of 12 tons per hour; one 3-ft. Menzies cone separator for rice and barley, with feed capacity of 12 tons per hour.

LECKIE SMOKELESS COAL CO., Anjean, W. Va.: Contract closed with Fairmont Machinery Co. for mine-run screening equipment with capacity of 400 tons per hour.

LORADO COAL MINING CO., Lorado, W. Va.: Contract closed with Jeffrey Mfg. Co. for cleaning equipment including Jeffrey Baum-type jig; feed size, 6x0 in. (6x⅜ in. to jig); sizes produced, 6x3, 3x1¼, 1¼x⅜ and ⅜x0 in.; feed capacity, 315 tons per hour; addition to existing tipple; to be completed in February, 1940.

LORAIN COAL & DOCK CO., Blaine, Ohio: Contract closed with Jeffrey Mfg. Co. for cleaning equipment including Jeffrey Baum-type jig; feed size, 5x0 in. (5x⅜ in. to jig); sizes produced, 5x2, 2x1¼, 1¼x⅜ and ⅜x0 in.; feed capacity, 320 tons per hour; addition to existing tipple; to be completed in February, 1940.

SEMET-SOLVAY CO., INC., Harewood mine, Longacre, W. Va.: Contract closed with Fairmont Machinery Co. for trip feeder and rotary dump, power-operated weigh basket; picking, crushing and screening facilities; 13-ft. 6-in. Chance cone for cleaning a maximum of 335 tons per hour of 4x¼-in. coal; also refuse- and rock-handling equipment; all equipment to be inclosed in modern steel structure with steel grating and concrete floors; dumping capacity, 720 tons of mine-run coal per hour; mine-run capacity delivered to cleaning plant, 400 tons per hour.

WESTMORELAND MINING CO., Blairsville, Pa.: Contract closed with Roberts & Schaefer Co. for complete Stump "Air-Flow" cleaning plant; capacity, 75 tons of cleaned ⅜x0-in. coal per hour; to be completed Jan. 15, 1940.

Mining and Combustion Engineers Review Common Problems in Joint Meeting

ENGINEERS and research men representing coal producers and consumers again sat down last month to discuss interrelated questions of mining and utilization. The occasion was the third annual joint meeting of the Coal Division of the American Institute of Mining and Metallurgical Engineers with the Fuels Division of the American Society of Mechanical Engineers, held Oct. 5-7 at the Deshler-Wallick Hotel, Columbus, Ohio. Approximately 200 members and guests of the two divisions registered for the meeting.

Starting with a symposium on the effect of mining methods on coal characteristics, the program moved through expositions of the fuel engineer as a connecting link between buyer and seller and the need for a code for testing coal to specific fuel applications. The place of coal and manufactured gas in the economic and social structure of the nation also was emphasized. How photography can contribute to a better understanding of combustion processes was illustrated by stills and motion pictures. A final report in a series of studies on coal-ash slags and their properties undertaken by the A.S.M.E. special research committee on removal of ash as molten slag from powdered-coal furnaces was presented.

Variations in characteristics of different seams over a relatively small area and in benches of the same seam in a single mine, said Thomas F. Downing, Jr., Philadelphia Electric Co., make delivery of a uniform coal extremely difficult unless great care is exercised in mining and preparation. When the averages for the different benches are within the limits of general market acceptability, the entire seam may be mined at one time. When this is not true, selective mining should be followed and each bench loaded out and prepared separately for its particular market. This may involve the use of two or more loading tracks underground to prevent mixing in coal sent to the cleaning plant. It also may be necessary to handle machine cuttings separately.

Roof control plays an important part in the picture, particularly in pillar robbing. If support is inadequate, roof pressures will crush the pillars and, in the case of falls, may materially increase the percentage of impurities mixed in with the coal. When pillars are to be left standing for a long time, they should be wider than where quick robbing is the rule. Here again two mine tracks—one for pillar and the other for face coal—may be advisable, with dumping at the tipple in proportion to the quantities of each class loaded. Smaller mines may eliminate additional trackage by layer loading.

In mechanical mining, declared Mr. Downing, opportunities for face preparation are limited. Shooting, too, is harder and breakage greater. The seam and its impurities usually are loaded out together. This means that the coal will have the average characteristics of the seam as a whole and that removal of impurities must depend largely upon mechanical cleaning.

Unlike bituminous, said C. A. Gibbons, general manager, Susquehanna Collieries Co., mixing of veins is standard practice in anthracite; impurities are removed in the cleaning process. Uniformity is the great cry today, remarked H. E. Eavenson, Eavenson, Alford & Auchmuty; the truth, however, is that we are producing coals too good for ordinary steam purposes. Channel sampling, said Prof. H. E. Nold, Ohio State University, can be very deceptive unless properly interpreted; more and better sampling is needed if full advantage is to be taken of variations in characteristics in different parts of the same seam.

An Anthracite Challenge

"Our anthracite reserves lie mostly in the Southern field. The fact that the mechanical mining of coal in this field is practically nil should be a challenge to its engineers. What are the many methods of mining throughout this region and why are they used? Cannot some standardization of methods be effected or new methods devised in order to make use of the present types of mechanical equipment for the mining of coal or serve as a basis for new developments? The systematic efforts of many persons would be required to answer these questions. Are not the possibilities worth the effort?"
—John W. Buch, at joint meeting of A.I.M.E. Coal Division and A.S.M.E. Fuels Division, Columbus, Ohio, Oct. 5.

Cleaning-⅜ Coal Costly

Many mechanized mines, declared J. B. Morrow, vice-president, Pittsburgh Coal Co., had been able to maintain premechanized percentages of prepared sizes by using Cardox shooting. Mechanized mining and mechanical cleaning promise the buyer both lower costs and higher quality if the industry does not go haywire in trying to clean minus ⅜-in. sizes. Capital and operating costs in such cleaning may be as much as three times those for cleaning plus ⅜-in. coals. Mechanically cleaning the larger sizes, he felt, did not increase costs.

In the early days of stripping, explained William C. McCulloch, preparation manager, United Electric Coal Cos., wedges were driven into the seam to split the coal off the solid face and only lump was loaded. Development of the power shovel made screening necessary to separate the lump out of the mine-run loaded by the shovel. To produce marketable screenings, however, strippers tried brushing the coal with brooms, scrapers, sweepers and blowing with compressed air. Some degree of selective mining also was tried out in certain pits. Delays to operation inherent in these methods compelled the present large-scale adoption of mechanical cleaning. Changing seasonal demands have led to the use of crushers and to variations in shooting practices to alter the size consist of the run-of-mine.

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"Yield" is a cardinal factor in successful anthracite operation. As used in the hard-coal region, said John W. Buch, instructor in mining, Pennsylvania State College, it means both (1) the percentage of run-of-mine recovered as marketable coal and (2) the proportions of the various sizes in that recovery. Due largely to the nature of the beds and the manner of their occurrence, breaker recovery—the percentage of run-of-mine recovered as marketable coal—varies widely throughout the region. Average recovery in flat beds is about 80 per cent; in pitching seams, about 55 per cent; silt accounts for about 8.0 per cent, and much of this is wasted.

Proper breaker design and operation are essential to maximum yield. Improvement in roll-crushing practices to meet increasing demand for the small domestic sizes with a minimum production of steam sizes and silt is needed. But in nearly every case of decreasing yield with a modern breaker, "it is safe to assume," declared Mr. Buch, that the reason will be found in the run-of-mine. Major effort to improve this yield during the past fifteen years, therefore, has been made underground. Changes made were accompanied by sufficient test data to determine intelligently the best mining practices. Determining factors were the lump coal and refuse in the mine car and the explosive and labor costs. A fair estimate for size distribution after crushing the lump coal is 85 per cent domestic, 13.5 per cent steam sizes and 1.5 per cent silt.

Improve Yield and Quality

As a result of these tests, continued Mr. Buch, the following generalizations may be safely made:

1. Black blasting powder and pellet powders produce better run-of-mine than permissibles;

2. Use of cutting machines in thin beds (48-in. and under) yields better run-of-mine than blasting from the solid;

3. There is a "best" method of drilling and blasting for each mining condition.

4. Refuse in the run-of-mine is variable but controllable.

Tests in five beds between black powder and permissibles showed an increase of 7.4 per cent in the yield of domestic sizes with black powder, an increase of 21c. per ton in average value per ton and a decrease of 7c. in explosives costs (see Table I). A test in a section of the Top Clark bed between pellet powder and permissible explosives indicated an over-all economy of 7c. per ton in favor of pellet powder. Three competitive tests (six successive cuts) between black blasting and pellet powders (Table II) showed little difference in the run-of-mine produced.

In 1937, continued Mr. Buch, only 4.6 per cent of the total anthracite tonnage was undercut by machine. Yet undercutting in thin beds reduces the quantity of explosives and increases the percentage of larger sizes. An analysis of four tests showed an over-all economy for machine cutting (exclusive of machine and bit expense) of 33c. per ton. Details are given in Table III. Little increase in domestic yield, however, can be expected with undercutters in thick beds, since in chamber mining, blasting from the solid with a single firing of black powder, "it is not uncommon to find as much as 95 per cent domestic sizes and larger in the mine car.

"There are five determinable factors" for establishing the "best method" for drilling and blasting. These are: (1) depth to drillholes, (2) spacing between holes, (3) angle of holes, (4) pitch to drillholes and (5) kind and quantity of explosive per hole. In testing a given condition, explained Mr. Buch, a miner's round was taken as the basis for successive test rounds. Only one factor was changed at a time in order to obtain comparative results. Finally, after testing for all factors, the best round was selected for the best method. "In all but a few cases, it was possible to show improvements in the round as originally made by the miner."

In mining the flat beds of the Northern anthracite field, both chamber-and-pillar and longwall systems are employed. The longwall system, however, is a special application of the slabbing method used with machine loading. In the pitching seams of the Southern field, the breast-and-pillar and slant-chute systems are used. Underground mining in the Panther Creek valley, said Mr. Buch, is over a century old. The "cut-back" method for mining breasts and the "chute-breast" method for pillar recovery are representative of systems followed throughout this area for many years in working the Mammoth bed. While the greatest possibilities for improved run-of-mine in this region lie in improved mining methods, considerable time is required to effect changes. Objectives of such changes, when made, are: (1) greater safety, (2) increased extraction, (3) lower mining costs, (4) less dilution of coal with rock and (5) decreased degradation.

A recent development for attaining these objectives by localizing the mining is the system developed at the Lehigh Navigation Coal Co. (*Coal Age*, August 1938, p. 25). Main and sub-chutes are driven in the rock under the coal bed. From these, other shorter rock chutes ("tappings") are driven to single, isolated areas of the bed. These areas are then worked out in four separate sections. Coal passes through the tappings to the main chutes and then into the mine cars. All chutes either quarter the pitch or are otherwise driven to lessen their angle with the horizontal, so that coal passing through them does not roll or slide too rapidly.

"Although there are no test data available to substantiate conclusions," stated Mr. Buch, "the effect of such an ingenious system is at once apparent. By confining active mining to relatively small areas, possibility for contamination from wall rock is much less; if a wall rock is encountered that is poor structurally, a small portion of the bed can be abandoned. With former methods, the presence of rock in the chutes was not always an indication that the breast or pillar was finished; hence rock was often drawn and loaded with the expectation that coal would again appear."

Coordination is one of the most difficult problems of business and one of the highest achievements of successful administration, declared T. R. Workman, combustion engineer, West Virginia Coal &

Harlan Coal to Go On Polar Trip

Harlan County (Kentucky) coal —200 tons of it—is going along with Admiral Richard Byrd on his projected expedition to the South Pole. Shipment of 4,000 100-lb. sacks of fine-grade stoker to Boston, Mass., started late in September. With this fuel, Admiral Byrd and his crew expect to cook and keep warm in temperatures running as low as 80 deg. below zero.

Table I—Comparative Yields: Black Blasting Powder vs. Permissible Explosives

		Black Blasting Powder				Permissibles			
		Per Cent		Average Explosives		Per Cent		Average Explosives	
Test	Coal Bed	Domestic Sizes*	Steam Sizes*	Value Per Ton†	Cost Per Ton‡	Domestic Sizes*	Steam Sizes*	Value Per Ton†	Cost Per Ton‡
1	Upper Four Foot	67.5	32.5	$4.10	$0.15	56.1	43.9	$3.78	$0.22
2	Top Clark	80.1	19.9	4.45	0.11	73.8	26.2	4.28	0.17
3	Dunmore No. 3	77.4	22.6	4.38	0.12	71.0	29.0	4.20	0.18
4	Three Foot	62.3	37.7	3.95	0.06	57.0	43.0	3.81	0.14
5	Red Ash (Top Split)	70.0	30.0	4.17	0.13	62.5	37.5	3.96	0.21
Average		71.5	28.5	4.21	0.11	64.1	35.9	4.00	0.18

Table II—Comparative Yields: Black Blasting vs. Pellet Powders

	Test No. 1		Test No. 2		Test No. 3	
	Black Blasting Powder	Pellet Powder	Black Blasting Powder	Pellet Powder	Black Blasting Powder	Pellet Powder
Per cent domestic sizes*	89.2	89.1	89.2	90.8	87.8	91.4
Explosives cost, per ton‡	6c.	4c.	5c.	4c.	13c.	7c.
Feet of hole drilled per ton	1.63	1.51	1.78	1.59	4.54	3.57
Tons of coal produced	23.5	19.8	21.4	25.4	11.6	15.8

Table III—Comparative Yields: Undercutting vs. Mining From the Solid

		Undercutting				Mining from the Solid			
		Per Cent		Average Explosives		Per Cent		Average Explosives	
Test	Coal Bed	Domestic Sizes*	Steam Sizes*	Value Per Ton†	Cost Per Ton‡	Domestic Sizes*	Steam Sizes*	Value Per Ton†	Cost Per Ton‡
1	Third	67.9	32.1	$4.11	$0.07	57.6	42.4	$3.83	$0.27
2	New County	69.3	30.7	4.15	0.12	62.1	37.9	3.95	0.28
3	New County	77.3	22.7	4.37	0.06	74.7	25.3	4.30	0.12
4	Bottom Clark	75.1	24.9	4.31	0.05	69.7	30.3	4.16	0.24
Average		72.4	27.6	4.24	0.08	66.0	34.0	4.06	0.23

* As determined after crushing to market sizes.
† Calculated from average values shown in Minerals Year Book, 1938.
‡ Based on cost of explosives to the miner. All figures on net-ton basis.

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GULF INDUSTRIAL LUBRICATION

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Coke Corporation. Because the operating and sales departments have no automatic common meeting ground, coordination is necessary. A measure of coordination is effected in some companies by the preponderance of influence of one department, but coordination of that character is unsatisfactory since it means either a restriction of sales opportunities or a sacrifice of mining efficiencies.

Proper coordination of production and sales requires an agency which is relatively independent of both departments. In the case of West Virginia Coal & Coke, responsibility for coordination has been centered in the combustion engineer. In consumer relations he acts under the direction of the sales department, of which, from an organization standpoint, he is a part; as a connecting link between sales and operating departments, however, he functions with a relatively free hand. To sum up, concluded Mr. Workman, "the combustion engineer in our company is all things to all men. To the operating department, he is the sales department—and an understanding, sympathetic sales department. To the sales department, he is operations—and a somewhat comprehensible operations. To the customers, he is the company in a somewhat broader sense than any more specialized representative."

"Why" of Customer Turnover

Customer turnover is both high and costly, remarked J. E. Tobey, manager, fuel engineering division, Appalachian Coals, Inc., discussing Mr. Workman's paper. When this turnover is 50 to 60 per cent, it is obvious that failure to smooth out customer complaints is responsible. The combustion engineer, added Mr. Benton, Carter Coal Co., is the only man who can take the gaff from both departments. Usually it is harder to make the sales department see the operating department's viewpoint than to persuade the operating men to take a sympathetic attitude toward the demands of the sales department.

Coal is of value, pointed out J. G. Bentley, Johnson-March Corporation, only when destroyed in the process of combustion. Coordination should recognize the nature of coal and see that particular coals are applied only to jobs for which they are best suited. "Don't try to sell every smokestack in the country." Too much emphasis cannot be placed on the place of the fuel engineer in consumer relations, declared L. A. Shipman, Southern Coal & Coke Co.

While there are a number of A.S.M.E. power-test codes, stated Robert L. Rowan, fuel engineer, General Coal Co., they are concerned primarily with equipment and the information developed with respect to fuel itself under such codes is limited and somewhat incidental. The American Society for Testing Materials also has published a number of codes for testing some particular property or feature of coal. But producer and consumer still lack any comprehensive combustion test code "drawn up for the express purpose of testing the combustion of fuel in various types of fuel-burning equipment."

Despite the constant increase in fuel-engineering data, continued Mr. Rowan, there are still many fuel properties about which little is known. No standard laboratory test has been set up for determining the coking and caking or agglutinating property. The same is true of tests for ignition. Knowledge with respect to plasticity should be enlarged. More should be known about the effect of size consist of the feed. Mr. Rowan urged action by the technical societies to further a proposed comprehensive code.

Before it is feasible to suggest such action, declared M. A. Mayers, it will be necessary for the industry to determine just what it really wants. Agreement with this viewpoint was expressed by A. R. Mumford, Consolidated Edison Co., New York; he did, however, approve of the joint committee action proposed by Mr. Rowan in principle. P. Nicholls, supervising fuel engineer, Central Experiment Station, U. S. Bureau of Mines, was another who inclined to the view that "we don't know what we want yet." Messrs. Shipman and Tobey supported the position that a code was desirable.

For boilers of 200 hp. and up, said William Lloyd, Combustion Engineering Co., in a paper briefed in the author's absence by Otto de Lorenzi, of the same organization, traveling-grate stokers are, "and no doubt will be for some time to come," the most generally used equipment for burning industrial sizes of anthracite. Because this coal is slow to ignite, furnace arches are necessary to assist and sustain ignition. Early installations of traveling-grate stokers had the so-called front arch, but "really satisfactory performance with the smaller sizes of anthracite" was not secured until the early 1920's, when the combination front-and-rear arch was introduced.

More recently, the long rear-arch furnace with practically no front arch but "with a more carefully worked-out technique in the handling of the air through the several sections of the fuel bed" has come into the picture. Because of the relatively higher efficiencies with this type of furnace, it is now favored except where physical limitations dictate installation of the combination front-and-rear arch furnace. Spreader stokers also have been adopted to a limited extent in burning small anthracite.

Back in 1912, widely fluctuating fuel-oil costs led the National Malleable Steel & Castings Co. to consider the use of pulverized coal for its open-hearth melting furnaces at Sharon, Pa. Equipment installed, said Joseph P. Kittredge, included pulverizers capable of grinding at least 90 per cent of the coal to 240-mesh and a Ruggles-Cole dryer. In actual practice, the percentage passed through 240-mesh has been between 95 and 97. Part of the secret of the success of this installation has been the fineness of the coal; part, training the melters to handle the flame properly.

Because pressures developed by coal during the coking process have caused serious trouble, explained Charles C. Russell, Koppers Co., Kearny, N. J., testing methods have been developed which definitely distinguish the dangerous coals from those which are safe to charge without endangering the oven walls. Several test methods have been evolved. The most

Coming Meetings

- Illinois Mining Institute: 47th annual meeting, Nov. 10, Hotel Abraham Lincoln, Springfield, Ill.
- West Virginia Coal Mining Institute: annual meeting, Nov. 10, Hotel Morgan, Morgantown, W. Va.
- Harlan County Coal Operators' Association: annual meeting, Nov. 15, Harlan, Ky.
- Coal Mining Institute of America: fifty-third annual meeting, Dec. 14 and 15, Fort Pitt Hotel, Pittsburgh, Pa.

Coal Companies Win Advertising Award

Harry V. Miles, advertising director, Cabin Creek Consolidated Sales Co., selling subsidiary of the Truax-Traer Coal Co., is formally awarded the prize for the year's best sales letter and advertising campaign by Mrs. L. Rohe Walters, wife of the president of the Direct Mail Advertising Association. Truax-Traer and Cabin Creek also captured a prize in the annual traveling exhibit by the Direct Mail Advertising Association. In the center is shown Professor Dameron, of Ohio State University. The presentation was made at the association's annual banquet in New York City on Sept. 28.

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successful apparently is that described several years ago in *Glückauf* by Koppers and Jenkner. This method uses a large test oven in which coal can be carbonized under substantially the same conditions as exist in full-scale ovens.

A test oven based on the Koppers-Jenkner principle was erected by the Koppers Co. at Kearny. One of the walls of this oven is entirely separate from the rest of the oven and is supported on wheels. Any movement or pressure developed by the coal in the oven chamber is transmitted to the movable wall. A 7:1 lever system, mounted on the back of the entire oven, is used for the transmission of the pressure or movement to the mechanism for measurement. Tests so far made confirm one of the most important Koppers-Jenkner findings. That is that the pressure developed during carbonization rises rapidly and reaches a maximum when the two plastic zones meet at the center of the oven. "After the peak of pressure is obtained, the pressure drops precipitately because of the shrinkage of coke formed."

With present-day emphasis on modernity, declared A. M. Beebe, general superintendent, gas department, Rochester (N. Y.) Gas & Electric Co., there is a tendency to belittle the importance of coal and gas simply because they are old-established energy industries. Yet, far from belonging to the horse-and-buggy era, both are important factors in the social and economic life of the nation. Although the percentage of energy contributed to the annual national supply by coal has been declining in recent years, it is still the most stable and important source of supply from the standpoint of dependable reserves. Gas and coal also far outshine fuel oil and hydro-electric power as employers of labor—no mean consideration in these days of widespread national unemployment.

Per Cent of Energy From Water

Despite water-power ballyhoo, the harnessed streams contribute only 10 per cent to current energy supply, and utilization of all known water-power resources would not raise that figure above 30 per cent. At the present rate of consumption, oil reserves have a life of about 14 years and natural gas from 20 to 25 years, while the life of the coal reserves is measured in thousands of years. Moreover, present methods of coal and manufactured-gas distribution escape the high transmission losses encountered in the delivery of other fuels. So they score again on the economy side.

Mr. Beebe made telling use of the figures on wage payments and taxes broadcast by the National Coal Association and introduced by spokesmen for that organization in Congressional hearings. Mine labor, he pointed out, receives an average of $1.27 per ton for every ton of coal mined; the labor charge on an equivalent quantity of oil is only 68c.; on natural gas, 8c.; and on hydro-electric power, less than 1c. For every million tons of coal mined, the industry pays $63,500 in social security and unemployment taxes; fuel oil on an equivalent energy production pays only $34,000; natural gas, $4,000, and hydro-electric, $500.

The final report in the series of investigations on the removal of ash as molten slag from powdered-coal furnaces was the work of P. Nicholls, supervising fuel engineer, and W. T. Reid, associate fuel engineer, Central Experiment Station, U. S. Bureau of Mines, and was presented to the meeting by the senior author. Viscosity of coal-ash slags up to temperatures of 2,900 deg. F. were measured by a viscometer. In only a relatively small portion of the field of compositions of coal ash, the investigations disclosed, did the slags have the melting characteristics of glasses. For most compositions, there is a distinct "liquidus" point: i.e., the temperature at which crystals begin to form. In complex slags, however, one form of crystal may begin to form at one temperature and other types appear at lower temperatures. For that reason, say the authors, the term "solid phase" is more general in its meaning than is crystals.

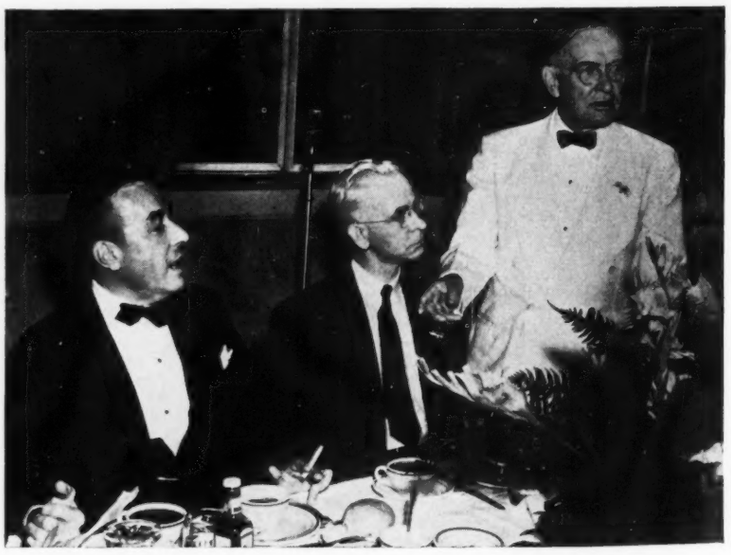
"If no solid phase exists, the melt will be a true fluid and will give true values for viscosity. If solid particles are present, they will increase the internal friction materially and the substance will not act as a true fluid. Its properties will tend to become more those of a plastic substance as the quantity of the solid phase increases. It requires time for the solid phase to form and it may take longer for it to redissolve. For example, in a high-alumina slag, crystals of corundum were formed that did not redissolve. Thus, measures of 'apparent viscosity,' obtained at temperatures below the liquidus, will vary with time; this variation being greater if the crystals tend to interlock or to fuse together."

From the limited data available for this report, the authors have plotted viscosities for 2,800, 2,600, 2,400 and 2,200 deg. F. and given the liquidus line for each temperature. The relation between flow temperature, as determined in the earlier investigations for use with slag-tap furnaces, and viscosity and liquidus temperature is derived. When complete trilinear diagrams are available, accurate predictions can be made on the effect of mixing the ash of two coals or the addition of the main constituents. Predictions of the relative fusion and clinkering characteristics of coals from the softening temperatures of their ashes, declare Messrs. Nicholls and Reid, may give erroneous comparisons. Initial and fluid temperatures, however, can be some additional guide.

Prefatory to the showing of pictures of combustion processes, A. A. Markson and W. H. Dargan, Consolidated Edison Co., presented a paper on the photographic study of steam-boiler furnaces and operation. This paper covered the selection of camera equipment, auxiliaries and film characteristics. Their pictorial presentation included stills and motion pic-

Sales of Mechanical Stokers Show Quick Seasonal Rise

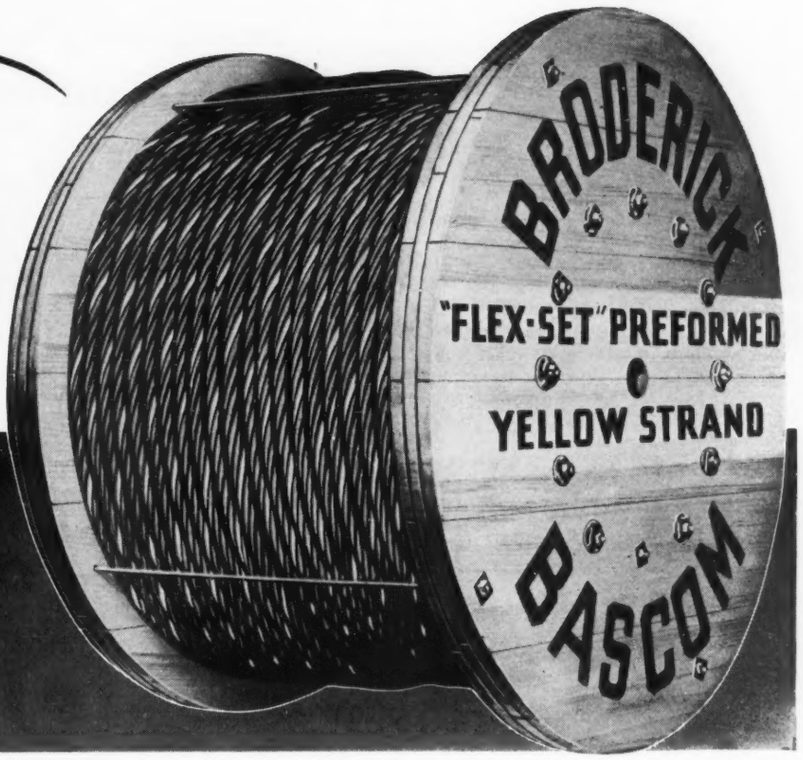
Sales of mechanical stokers in the United States during August last totaled 15,058 units, according to statistics furnished the U. S. Bureau of the Census by 101 manufacturers (Class 1, 61; Class 2, 41; Class 3, 39; Class 4, 38; Class 5, 15). This compares with sales of 9,525 units in the preceding month and 12,859 in August, 1938. Sales by classes in August last were: residential (under 61 lb. of coal per hour), 13,137 (bituminous, 11,703; anthracite, 1,434); small apartment-house and small commercial heating jobs (61 to 100 lb. per hour), 835; apartment-house and general small commercial heating jobs (101 to 300 lb. per hour), 710; large commercial and small high-pressure steam plants (301 to 1,200 lb. per hour), 299; high-pressure steam plants (more than 1,200 lb. per hour), 77.



Birmingham Industrial Leaders Discuss Coal

Hugh Morrow, president, Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., is shown introducing Heath S. Clark, president, National Coal Association, principal speaker at the recent annual meeting of the Birmingham Traffic and Transportation Club. Seated in the middle is J. C. Taylor, president of the club, while barely visible at the extreme right is J. D. Battle, executive secretary, National Coal Association. Mr. Clark commented on the marketing activities of Alabama Coals, Inc.

Above Ground
Under Ground



"Flex-Set" Preformed Yellow Strand
Stands the Gaff!

Yellow Strand has always been considered a really super-rope by miners in every field. Now, "preforming" the wires and strands before they go into the rope has worked a miracle. It has added qualities never possessed by any rope of standard type. With absolutely no change in the quality of the wire, the "construction" or lay, preforming makes a rope that is practically pre-broken in. It is limp and easy to handle — reaves easily and resists kinking. Rotation on sheaves is reduced, and resistance to fatigue is greatly increased.

Remember, "Flex-Set" Preformed Yellow Strand is regular Yellow Strand *plus* all the above qualities that make for longer life and economy.

You will appreciate the excellent service it gives on shaft hoists, mining and loading machines, on shovels and draglines, and for haulage.

Let your next wire rope order read "Flex-Set" Preformed Yellow Strand.

Factories: St. Louis; Seattle; Peoria

Branches: New York; Chicago; Seattle; Portland; Houston

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Broderick & Bascom Rope Co. St. Louis

tures in black and white and in color of flames and furnaces at Consolidated Edison plants. Mr. de Lorenzi followed with movies of pulverized-coal flames at Windsor Station, W. Va. Motion pictures of residential stoker fuel beds were presented by S. Konzo, Engineering Experiment Station, University of Illinois.

Four inspection trips were offered on the last day. Some members visited the plant of the Jeffrey Manufacturing Co.; some inspected the facilities of Battelle Memorial Institute and others the Columbus municipal light plant with its water-cooled stoker, or the Big Walnut and Pickway stations of the Columbus & Southern Ohio Electric Co. In the afternoon, those who had no pressing engagements elsewhere sweltered in the stadium watching Ohio State open its football season with a 19-to-0 victory over the University of Missouri.

Sentiment at the meeting favored Birmingham, Ala., for the 1940 joint sessions.

—◈—

Colonel Roberts Retires

Col. Warren R. Roberts retired on Sept. 30 at president of Roberts & Schaefer Co., Chicago. He had been head of Roberts & Schaefer for more than thirty-five years. He will make his home in Miami, Fla.

—◈—

Hanna Opening New Mine

The Hanna Coal Co. is opening another mine near Georgetown, Ohio. The new operation will be known as Georgetown No. 12.

—◈—

Illinois Institute Program

Maintenance on locomotives, sectionalizing power circuits and loading machines; blasting, and selling problems will feature the discussions of the Illinois Mining Institute at its 47th annual meeting, to be held Nov. 10 at the Hotel Abraham Lincoln, Springfield, Ill. Under direction of President Paul Weir, the program will include the following papers:

"Locomotive Maintenance," Hector Hall, Bell & Zoller Coal & Mining Co.; "A.c. and D.c. Sectionalizing Power Circuits," A. G. Shaffer, Chicago, Wilmington & Franklin Coal Co.; "Loading-Machine Maintenance," C. C. Conway, Consolidated Coal Co.; "Factors Influencing Blasting," John L. Romig, Atlas Powder Co.; "Sales Problems Created by Compensation Laws," Norvin H. Vaughan, district sales manager, Consolidated Coal Co.; "The Future of Illinois Coal," Dr. Clayton G. Ball, consulting engineer. Discussions will follow the presentation of each paper. A report will be made by John E. Jones, chairman, committee on scientific studies of physical conditions and improved practical analyses of the hazards of coal-bed and adjacent strata which affect safety in coal mining of Illinois.

At the annual banquet, in the evening, President Weir will preside and certificates of honorary life membership will be presented to Thomas Moses, formerly president, H. C. Frick Coke Co. and the United States Coal & Coke Co., and Eugene McAuliffe, president, Union Pacific Coal Co.

Executive Viewpoint Is Emphasized At National Safety Congress

THAT management backing is essential for successful conduct of accident-prevention work was repeatedly stressed at the 28th National Safety Congress, Oct. 16-20, Ambassador Hotel, Atlantic City, N. J. L. C. Campbell, assistant to the vice-president, Koppers Coal Co., Pittsburgh, Pa., chairman of the opening session of the Mining Section, led off by pointing out that responsibility for an injury lies not only on the worker but on the safety force and the executive department as well. Freedom from injuries cannot be obtained, he asserted, unless executives do their part.

Angus D. Campbell

Elected general chairman of the Mining Section. From Canada, he is the first of that country to receive such honor

The executive, declared Heath S. Clark, president, National Coal Association and Rochester & Pittsburgh Coal Co., Indiana, Pa., although interested from other standpoints, necessarily looks at safety largely from the cost angle. With both hazards and remedies known, the problem is to get men to apply the necessary safeguards. This necessitates proper educational measures and cooperation between all interests involved.

Mining is a hazardous industry and can benefit from a wide variety of safety measures which not only affect profit and loss but yield many intangible benefits. Hazards are not static but change with methods of mining. Mechanical mining, now coming into the picture in the Appalachian field, brings new problems in loading, dust, ventilation and electricity. While statistical information is somewhat meager, it is accepted, said Mr. Clark, that adoption of mechanical mining is followed at first by increase in injuries, which rate gradually drops, however, below that for hand-loading methods.

"This being true," he continued, "it must in some measure be attributed to lack of proper appraisal of the safety problems involved and a lack of intelligent forethought and sound planning to meet them." In most instances where installation of mechanical loaders is contemplated, one executive must make the final decision. This executive should personally see that operating and engineering staffs have given careful consideration to safety, remembering that safety and efficiency go hand in hand.

From the economic standpoint, workmen's compensation acts have been of major importance in advancing safety. An amazingly small proportion of accidents are unpreventable; in almost every case, human error somewhere was responsible. Education is the obvious answer and education of men and management has been largely responsible for the progress made. The "merit system" used in Pennsylvania, under which an operator receives reductions in compensation rate for specific safety measures, was highly recommended by Mr. Clark.

Cooperation Is Necessary

Safety education is essential, but cooperation to make it effective is a problem. Unless the executive head is safety-minded, there is little likelihood that his organization will be. To give lip service to safety is not enough; real interest must be demonstrated by devoting time to it. An example of what can be done was cited in the accomplishment of a State mine inspector. As a result of his work and the willingness of operators and men together, the 1938 frequency rate, based on million man-hours' exposure, was 22 per cent under 1937, while the first seven months of 1939 was 30 per cent under 1938. Such a safety interest has been created that at a recent first-aid meet more than 12,000 miners attended.

Commenting on the Neely-Keller bill for Federal inspection of coal mines, Mr. Clark stated the industry feels that the bill, if enacted into a law, would retard rather than promote safety. Many State mine departments are efficient and if any are not, steps should be taken to remedy the situation because one backward State may eventually result in unwanted legislation. Today, the industry has tools to work with and can call on a variety of organizations for assistance. But for a successful program the willingness of the men to learn must be matched by the willingness of the executive to back up safety measures.

Safety problems, viewed from the executive standpoint, are substantially the same for all types of mining, said Cadwallader Evans, Jr., vice-president Hudson Coal Co., Scranton, Pa., "except that the executive's problems are modified by the size of the property and the number of individual operations he must attempt to control."

"The problem faced by the larger anthracite companies has been to find methods of bringing home to widely scattered subordinates their individual responsibility for their own part of the general safety program." The Hudson Coal Co. realized this ten years ago, when results were getting progressively worse. Outside help was called in, and as a result

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A wire rope that reduces rope wear to a minimum—that provides maximum resistance against fatigue—Roebling "Blue Center" assures maximum rope operating economy. It is the highest achievement of Roebling's over 90 years of rope making experience! Ask about this rope—either standard or preformed.

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BRANCHES IN PRINCIPAL CITIES

STRONGER—Wire of highest strength consistent with ductility and toughness

TOUGHER—Provides maximum resistance against wear, sudden shocks, vibration

SAFER—Unequalled for uniformity of quality

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THE HIGHEST DEVELOPMENT IN ROEBLING WIRE ROPE

the company was convinced that the safety program was more one on paper than in hearts and minds, not only with superintendents and their foremen but, more important, with the general manager and the vice-president.

The mental outlook of higher executives and subordinates down to driver bosses was changed. The problem now is to change the mental attitude of the workman so that he realizes responsibility in protecting himself and also that his freedom from injuries depends to a large degree on the actions of other men.

Competitive spirit was aroused by awarding a safety flag each quarter to the mine with the best record. This entailed development of a system of rating each boss quarterly, on frequency and severity.

With a multiplicity of beds and reming, roof falls are a major problem. Control is difficult because varying conditions make it impossible to standardize on precautionary measures. Dependence must be placed upon the section foreman and in turn on the miner. Foremen are required to render a personal report on every roof-fall injury, which passes through the hands of the colliery superintendent, the general manager and the vice-president, any one of whom may return it for additional data. Such reports make the foremen realize their personal responsibilities for all injuries.

Good Records Rewarded

Good records by foremen have been rewarded; the latest step is admission to membership in the Safety Key Men's Organization. For membership, a section foreman must have supervised one full year of work (at least 50,000 man-hours) without a lost-time injury and mine foremen must have won the company safety flag at least once.

One method of increasing interest is by use of special safety posters, tacked onto each section foreman's bulletin board. Issues costs about $155. The *Safety Commentator*, a monthly mimeographed magazine, is another stimulant distributed to about 1,250 of 7,500 employees at a cost of $55 to $60 per month. Broadcast distribution is banned on the ground that indiscriminate distribution would make it less read.

During the past year the Bureau of Mines has trained a selected group in first-aid work who in turn trained the others. A total of 7,300 employees and 1,100 outside people received instruction.

The problem is to maintain interest among the men. Supervisors are educated to the point that most of them are interested continuously, but the problem is retaining and re-educating that 15 to 25 per cent of men who are fatalists, careless, or are unacquainted with the dangers that face them.

The most common causes of hurting a man, said Mr. Campbell in opening the discussion are (1) something falls on him; (2) he falls; or (3) something hits him. The solution, therefore, is to make it impossible for him to fall, be struck or otherwise get injured.

Questions raised in his mind by statements in Mr. Evans' paper were posed by Carl A. Peterson, safety inspector, Hudson Coal Co. The answers, in his experience, have yet to be found and perhaps there are none to such queries as: How can a standard system of roof control be developed where many seams are being mined and conditions vary widely, as in the anthracite region? How can a foreman foresee the hazards? What is the best method of training foremen? Of training workmen? What can be done to keep a foreman on his toes? How can the 15 to 25 per cent of fatalists be reached and persuaded to change their viewpoints?, etc.

Standard timbering methods are in use at his company, declared F. E. Bedale, safety director, Consolidation Coal Co., Fairmont, W. Va. Developing standards to meet various conditions has its difficulties but can be done by using three or four in one seam. A good safety record is attained by foreseeing hazards rather than waiting until they are met.

John T. Ryan

Who was in charge of the entertainment features of the Mining Section sessions. The section recognized the high caliber of relaxation provided by again reelecting the president of Mine Safety Appliances Co. to head the entertainment committee for another year.

The way to train workmen, added J. V. McKenna, safety director, Pittsburgh Coal Co., is in small groups, by the assistant foreman.

Federal and State aims in safety, and the places of the U. S. Bureau of Mines and State departments in accident prevention were the themes of the second day's session, with Mr. Campbell still wielding the gavel. The Bureau of Mines, declared John W. Finch, director, in a paper read in his absence by Dan Harrington, chief, Health and Safety Branch, was created to help mining people and its special duty is finding facts and making them available to all. The regulation of mining operations is a function of the States, and the Bureau has no authority to compel compliance; its work is investigative and educational. With 3,000 or more fatal accidents and 200,000 or more lost-time injuries occurring yearly when the Bureau was created, it was imperative that everything possible be done to remove some of the mining hazards. From a monetary viewpoint also, safe practices usually prove the cheapest.

The field men of the Bureau's safety division are engaged continually in instruction in first aid, use of mine-rescue apparatus and other safety work. "During the last fiscal year, 120,733 full courses were given in mine rescue and first aid . . . in 937 towns, 40 States and Alaska. Since this work was started more than 1,265,000 persons have been given courses." Much information also is being obtained and disseminated on everything having a bearing on accidents. In addition, the Bureau renders important service in the collection of statistics on accident occurrence, production and employment.

The dominating motive of the founding of a Federal mining agency was to have the Federal Government aid the States to ascertain why there were so many coal-mine disasters and what could be done to reduce their number and decrease loss of life. "That a good job has been done is shown . . . that in the fiscal year ended June 30, 1939, there was no major fire or explosion in any coal mine in the United States, this being the first 12-month period without such a major disaster in at least 60 years. Moreover, in the past fiscal year only sixteen persons were killed by minor explosions of gas or dust, as compared with the eighteen major explosions and fires causing 918 deaths in 1907, a few years before the establishment of the Federal Bureau of Mines."

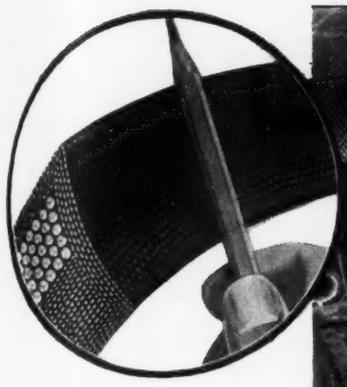
Progress in the elimination of other causes of mine accidents has not been as spectacular but our mines now are producing coal and other mineral products with accidents reduced 50 per cent or more as compared with the period preceding the Bureau's establishment.

Stresses Role of Education

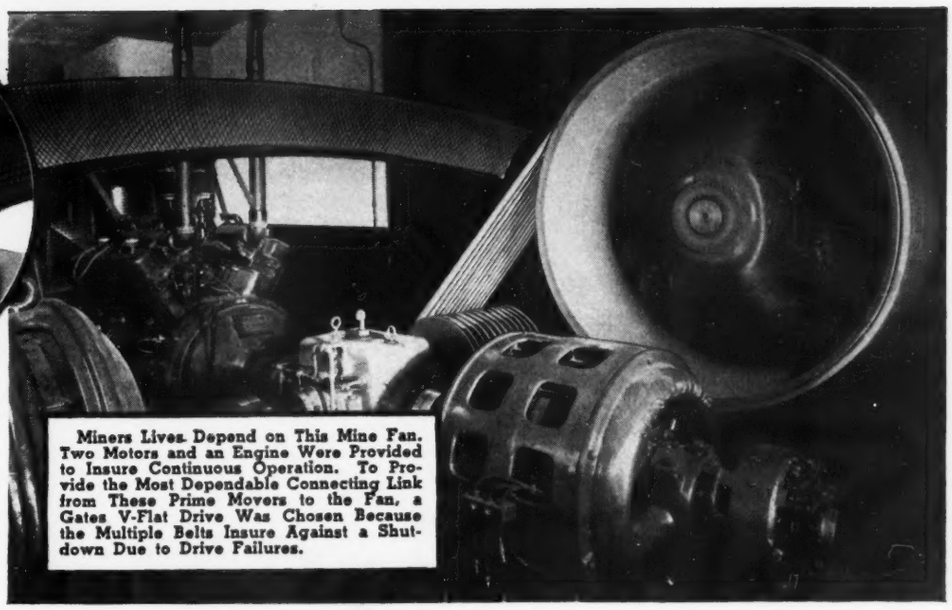
Education is the most important element in safety, asserted J. J. Forbes, supervising engineer, Pittsburgh Experiment Station, U. S. Bureau of Mines, and first-aid training helps the worker visualize the results of injury. Thus he is more likely to take care not to be hurt. Explaining the Bureau's plan for setting up a safety program and keeping it going, he declared that where sincere efforts are being made they are getting results. A recent educational development of the Bureau is sound movies showing the safe way of doing various jobs around the mine.

Contending that accident rates should be based on man-hours rather than on tons, Walter N. Polakov, director, engineering department, United Mine Workers, expressed the opinion that on the man-hour basis the trend of injuries actually is higher than available statistics indicate. The Bureau of Mines, he maintained, has inadequate data on non-fatal injuries, and he stated that a letter to State mining departments on this point had brought only two replies stating that such information was available. In one such case, the State department observed that the statistics were of questionable value as they had no means of checking their accuracy.

Strong exception to Dr. Polakov's remarks was taken by several speakers. The Bureau, declared W. W. Adams, supervising statistician, U. S. Bureau of Mines, has been keeping a record of this type for coal mines since 1931. Following the creation of the post of safety director by the Big Sandy-Elkhorn Coal Operators' Association, careful records have been kept, said A. D. Sisk, director. These



The **Concave Side** IS A GATES PATENT



Miners Lives Depend on This Mine Fan. Two Motors and an Engine Were Provided to Insure Continuous Operation. To Provide the Most Dependable Connecting Link from These Prime Movers to the Fan, a Gates V-Flat Drive Was Chosen Because the Multiple Belts Insure Against a Shutdown Due to Drive Failures.

Prove this *Yourself!*

Grip a Bending V-Belt With Your Fingers and Learn ***WHY*** the Concave Side Makes

A BIG SAVING in Belts and Power

What Happens When a V-Belt Bends

FIG. 1

FIG. 2

If you want longer belt wear and better transmission of power, make this simple test:

Take any V-belt that has *straight* sides. Bend that V-belt while you grip its sidewalls between your fingers and your thumb. You will *feel* the sides of the belt *bulge out*—as shown in figure 1 on the left. Clearly, that out-bulge gives the belt a shape that does not fit its sheave groove.

Now look at figure 2. There you see what happens when you bend a belt that is built with the patented *concave* side. You get a similar change in sidewall shape — but what a *different result!* The precisely engineered concave side becomes perfectly *straight*. This belt, when bent, exactly fits its sheave groove —and two big savings result.

First:—With no out-bulge of the sides, the *full width* of the belt *uniformly* grips the sheave groove wall. This means *uniform* wear—*longer life*. Second:—The full side-width grip on the pulley carries heavier loads without slippage. This saves belt wear—and it saves a lot of power, too!

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records show that safety measures sponsored by the Bureau have been directly reflected in reduced injuries. Educational measures include safety contests and monthly meetings of employees.

High praise for the work of the Bureau in the anthracite region was given by W. G. Metzger, safety engineer, Hudson Coal Co., who doubted the fairness of Dr. Polakov's criticisms. Difficulties in getting complete statistics are understandable, considering that companies report voluntarily and that there are many small organizations difficult to cover. Echoing this statement, C. W. Gibbs, general manager, Harwick Coal & Coke Co., Pittsburgh, Pa., pointed out that the Bureau needs money to expand its facilities for gathering data.

Pennsylvania's aim, declared John Ira Thomas, Secretary of Mines, is to make its mines and workers as safe as is humanly possible. Injuries were accepted as a natural phenomenon in the early days, said Mr. Thomas, and this attitude did not undergo change until passage of the first compensation legislation in 1915. This act cleared the way for determining the dollar-and-cents cost of injuries and as a result operators and others really became interested. Now all possible means of stimulating employee interest are used; operators assist in training with financial aid; protective clothing is widely used and training in first aid is widespread.

Personal injuries, in Mr. Thomas' opinion, are caused by: (1) the inherent risk of employment, (2) ignorance or inexperience, and (3) carelessness. A study of 1,718 fatalities over a period of years has shown only 22 per cent which should be classed as "unavoidable" and this due to the risk of employment. Education will eliminate injuries due to ignorance or inexperience, while discipline is the medicine for carelessness. A total of 116,000 men were employed in bituminous mining in Pennsylvania in 1938. Of this total, 7,500 were injured. The fatality rate in the State was 1.74 per 1,000,000 tons in 1935, compared with the United States' 2.60. The department follows advances in mining methods and new developments in safety and, when worth while, they are incorporated in the mining code.

Colorado Is Safety Minded

With a production of 5,000,000 to 6,000,000 tons a year and some 350 coal mines of which only 75 are on a railroad, six inspectors are employed in Colorado and must examine each mine at least every four months, said Thomas Allen, chief coal mine inspector. By cooperation with the State Board of Vocational Training, partial safety instruction has been given 5,000 to 6,000 men of an average of 9,000 to 10,000 employed. The board also trains men for certificates of competence through arrangements with the U. S. Bureau of Mines for training in first-aid; some 5,000 men have received instruction. Examinations are compulsory for all officials from shotfirers up. About 500 men have Bureau of Mines certificates in mine rescue, while State certificates (based on the same course) have been issued to 3,500 to 4,000 men.

Colorado has vocational schools to train boys for a coal-mining career, and where such schools have not yet been built, instruction is given through the school departments. There is a crying need for such training, Mr. Allen contended, as otherwise boys are thrown headlong into an unknown and hazardous occupation, which not only increases likelihood of injury but also lengthens the time before they return maximum value for their pay.

Holmes safety chapters were praised by Mr. Allen, who stated that Colorado paralleled them with women's organizations, thus bringing home to the wives just what they stand to lose if the breadwinner is hurt or killed. Complete women's organizations now function in four of the State's six districts and 1,500 women have been trained in first-aid.

The competitive spirit is stimulated by a State-wide contest and every six months the mine with the least number of accidents—serious or otherwise—gets a silver shield. If won four times, it becomes a permanent possession. Results of safety measures include a cut of 33 per cent in injuries in late years with 100 per cent labor cooperation.

Taking note of resistance to Federal inspection of mines, Mr. Allen declared that they should offer something in its place. Expansion of the work of the Bureau of Mines would be a good alternative and organizations favoring the present measure might find that backing State departments and helping them improve services would accomplish the end.

Continuation of the discussion from the preceding day opened the Wednesday program. For the past five years, a record containing 95 to 99 per cent of all injuries has been kept, stated N. P. Rhinehart, chief, West Virginia Department of Mines, and non-fatal statistics are on file, available to anyone. An outstanding safety record has been made, and if all would act together, there would be no need for studying statistics.

Rehabilitation of the injured was the keynote of the closing session, conducted by Chairman Campbell. The object of rehabilitation, said a paper prepared by Dr. Henry H. Kessler, medical director, New Jersey Rehabilitation Clinic, Newark, and presented by Dr. E. M. Finesilver, should not be a monetary reward but return of the worker to a condition fit for work.

Workmen's compensation laws are quite vague on rehabilitation, pointed out R. M. Hartman, secretary, West Virginia State Compensation Commission. In most States the program is definitely inadequate and many times the early closing of a claim is considered a saving, but in reality the injured becomes a burden on society and also the employer must train a new man. Lump-sum payments are to be spurned.

How successful a safety program may be was brought out by George C. Bateman, secretary-treasurer, Ontario Mining Association, Toronto, Ont. Membership is voluntary and involves employment of 28,000 men. All are covered by the workmen's compensation act and there is no reinsurance or individual coverage. There is no limit of time for the payment of compensation or medical aid, although the amount for total permanent or total partial disability is limited to two-thirds of maximum of $2,000 per year. The estimated cost for compensation and medical aid of a recent mining case was $23,000. Total cost is paid by employers, and the average assessment rate for mining per $100 payroll is approximately $1.75. This rate covers compensation and medical aid for accidents and all industrial diseases, except silicosis.

"Approximately 40 per cent of the total men employed work for firms which have a rate of 0.11 lost-time accidents per 1,000 man-shifts . . . This means, that in those firms, if the present record is maintained, the average employee may expect to work 30 years with only one accident involving lost time." One of the larger mining companies having group insurance for its men has a rate of $10.24 per $1,000, which is lower than many chain stores can obtain.

Retiring general chairman Campbell has been elected vice-president, Industrial Safety, National Safety Council, for the coming year.

OFFICERS-ELECT

Angus D. Campbell, McIntyre Porcupine Mines, Ltd., Schumacher, Ontario, Canada, was elected general chairman of the mining section for 1939-40 at the National Safety Council meeting in Atlantic City. Other officers elected by the mining section were:

First vice-chairman, Cadwallader Evans, Jr., vice-president and general manager, Hudson Coal Co., Scranton, Pa.; second vice-chairman, W. D. Haselton, Pickands, Mather & Co., Duluth, Minn.; third vice-chairman, N. P. Rhinehart, chief, West Virginia Department of Mines, Charleston; secretary and editor of news, Daniel Harrington, U. S. Bureau of Mines, Washington D. C.

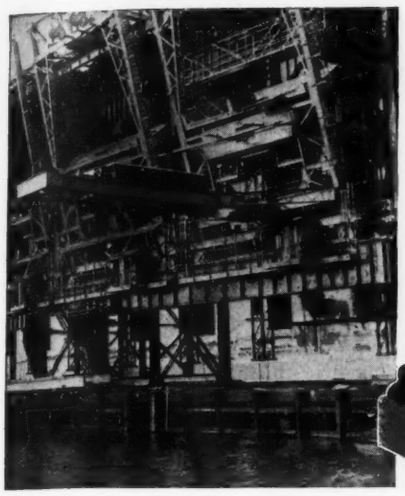
Committee chairmen: Posters, J. J. Forbes, supervising engineer, Pittsburgh experiment station, U. S. Bureau of Mines; Statistics, W. W. Adams, supervising statistician, U. S. Bureau of Mines, Washington, D. C.; Entertainment, J. T. Ryan, president, Mine Safety Appliances Co., Pittsburgh, Pa.

To Discuss Industrial Health

That "healthy workers make for healthy business' will be the theme of the fourth annual meeting of Air Hygiene Foundation, to be held Nov. 14-15 at Mellon Institute, Pittsburgh, Pa. Dr. H. B. Meller, managing director, says that reports on the Foundation's medical and engineering research, including latest advances in employee health protection, and reports on the impact of health on employer-employee relations will be made to representatives of the 200 industrial concerns affiliated with the Foundation.

Andrew Fletcher, vice-president, St. Joseph Lead Co., will point out specific dollars-and-cents savings resulting from proper health precautions. A form is planned to show that "Industrial Health Pays Double Dividends": (a) economic savings, (b) improvement in labor relations and public good will. Robert J. Watt, American Federation of Labor and representative of the U. S. Labor Department at the International Labor Office, Geneva, Switzerland, is scheduled to speak on labor's interest in occupational di-

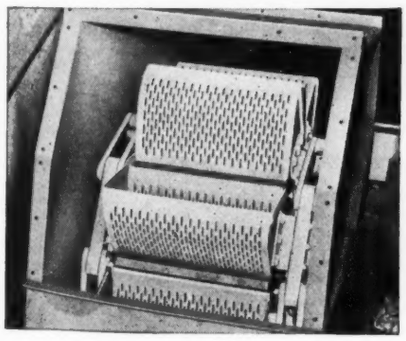
Want your equipment to weigh less. ...last longer...do more work?

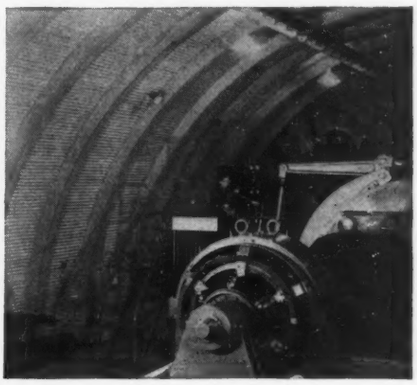


Lightweight COR-TEN *boom saves new pier construction.* To meet weight restrictions imposed by the limited supporting capacity of the existing pier structure, drastic weight savings were effected in this side wall loading machine by building the boom of U·S·S COR-TEN.

COR-TEN *Mine Car Body weighs 25% less,* carries approximately 26% more payload than a car body of similar dimensions built of standard structural steel. Principal weight saving was accomplished by reducing thickness of sides and ends from 3/16" to ¼", the floor from 5/16" to ¼", without any reduction in strength or durability.

COR-TEN *Elevator Buckets Last 40% Longer.* 82 COR-TEN-built buckets in this coal washing plant elevate wet refuse, slate and other foreign material. In addition to the abrasion encountered when the buckets drag their load from the bottom of the elevator, they are subjected to severe corrosive action due to alternate wet and dry conditions caused by 8-hour daily shutdown.





U·S·S COR-TEN *roofs a hoist room 2000 ft. underground.* ⅛" corrugated U·S·S COR-TEN sheets supported on cambered COR-TEN I-beams, line this hoist room of the Sullivan Mining Co. mine at Gem, Idaho, built two miles into the mountain. COR-TEN used in place of the concrete block construction originally planned, provides the great strength required to withstand the hazards of falling rock and also assures superior resistance to the corrosive action of mine water. "U·S·S COR-TEN," say the owners, "has given very satisfactory service."

BECAUSE U·S·S COR-TEN has a yield point approximately twice as high as ordinary structural steel and is 4 to 6 times more resistant to atmospheric corrosion, its most obvious advantage in mining equipment is in reducing deadweight. And COR-TEN has done a magnificent job in this respect.

But COR-TEN has other superiorities over structural quality steel. It is tougher, better able to resist impact, shock and vibration. Its abrasion resistance is almost one-third greater. That's why you'll find U·S·S COR-TEN being used more and more, not alone to decrease the drag of deadweight, but to increase the *life* of equipment — to fight corrosion — to decrease wear—to give added strength and durability to parts subjected to destructive stress and strain.

A few such COR-TEN applications are illustrated here. They were developed by designers of coal mining equipment who were determined to use to the full extent the many advantages this versatile steel offers.

In your equipment there must be many places where U·S·S COR-TEN steel will justify its use on a basis of economics. Where it will lengthen useful life — where it will give you an added sales feature — where it will show advantageously on the profit sheet of the user.

All we ask is the opportunity to go over your designs with you—to show you what others have done—to prove how readily U·S·S COR-TEN can be applied—and how little it costs to use.

USS

This symbol represents the highest quality, the finest metallurgical service.

HIGH TENSILE STEELS

AMERICAN STEEL & WIRE COMPANY, *Cleveland, Chicago and New York*
CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
COLUMBIA STEEL COMPANY, *San Francisco*
NATIONAL TUBE COMPANY, *Pittsburgh*
TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*

Scully Steel Products Company, Chicago, *Warehouse Distributors* · United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

sease prevention. A symposium on absenteeism, intended to develop measures whereby companies can reduce time lost by employees through illness, will be presided over by Dr. A. J. Lanza, assistant medical director, Metropolitan Life Insurance Co.

Early Coal Buying Urged To Aid Car Situation

With the purpose of encouraging early coal purchases for winter needs, F. A. Schleifer, traffic manager, Franklin County Coal Corporation, discussed conditions brought about by changes in mine-car ratings, speaking before the Midwest Shippers' Advisory Board and the Springfield Transportation Club at the Leland Hotel, Springfield, Ill., on Oct. 5. The board estimated that Midwest Coal and Coke shipments would increase 15 per cent [later revised to 20 per cent] during the last quarter of this year based on normal conditions. He emphasized that no consideration was given to such variable factors as the possible effects of the European conflict, neutrality legislation, government coal prices, or weather conditions.

Consumers' Stocks Are Low

Because consumer and industrial coal stocks are generally low, he said, the immediate problem before the industry was to meet demand for replenishment. In this connection he called attention to the special report of the coal and coke committee of the Midwest Shippers' Advisory Board with respect to current coal-car supply, which follows:

"Mine-car ratings of Illinois coal mines will be cut from 200 per cent to 100 per cent effective Sept. 25, by executive order of the Association of American Railroads. This action was taken because of the growing demand for coal cars. Although there is no car shortage today in Midwest territory with respect to available equipment, there is, however, a definite stringency in the supply of certain classes of cars such as hoppers and 40-ton cars. To obviate the probability of a general car shortage, all interested parties are urged to participate in a cooperative movement, by concerted action, to expedite the handling of coal cars. Of outstanding importance is the following:

"1. The coal operators, railroads and coal dealers will be hampered in their efforts to supply coal demanded by the public in point of time unless the bottle-neck, dealer delivery to consumer, is broken or widened to permit a steady flow of coal from the mines over the rails to and through the dealer to the ultimate consumer. Snow flurries customarily sound the first call for coal in substantial volume by the majority of consumers, and the rush is on. Why do they wait? The right answer is complex and has been sought for years.

"2. Orders for coal should be placed with the coal operator as far in advance as is possible to give the operator sufficient time to order such special equipment from the railroad company and for the latter to obtain and deliver such equipment to the mines for immediate loading and shipment.

"3. Orders for coal should specify a preferred and an alternate type of car to assure quick shipment in the event the preferred type of car is not available at a given time. Orders calling for 'hoppers or gondolas' or, conversely, 'gondolas or hoppers,' according to the dictate of the preference, will permit the industry to hum with activity and operate at maximum efficiency.

"4. Prompt and complete unloading of cars upon delivery for quick return to the mines for reloading and shipment.

"Railroad service, repair programs, the purchase of new railroad equipment, etc., are moving at top speed. The coal operator is ready to supply the coal if the cars in which to load it are available. The coal and coke committee is of the opinion that a general shortage of coal cars can be avoided by full observation of paragraphs 1 to 4, and if eleventh-hour orders for cars are placed sufficiently in advance of the eleventh hour whenever possible to permit for handling.

"The collective effort contributed will in the last analysis determine the measure or degree of benefits to be elicited by all. It can be done."

Mr. Schleifer expressed gratification at the response to the board's suggestions and gave assurance of the coal industry's support until normal car supply is restored. He conceded that the operators had accepted the 100-per-cent rule reluctantly, but emphasized that the acceptance had been made in a spirit of cooperation and expressed the hope that continuance of coordinated effort would soon bring about restoration of the 200-per-cent rule.

Personal Notes

STANLEY J. ALLING, formerly advertising manager of the *Coal Herald*, is now associated with the McGraw-Hill Publishing Co., Inc., as business manager of the Keystone Coal Buyers' Manual.

HENRY W. BAUER has been promoted to chief engineer by the West Virginia Coal & Coke Corporation, Omar, W. Va.

Ancient Mine Machinery Uncovered in Indiana

All was calm on the Indiana front early in October. The diesel stripping shovel was swinging along in business-like fashion in the workings of the Mackey Coal & Clay Co. pits south of Brazil when without warning the enemy was encountered. The big steel jaws of the monster bit something hard; the machine shuddered, reared back for another charge.

The shovel had bit through into the workings of the old Woodruff & Trinkle mine, abandoned sixty years ago when the tipple was burned during one of the recurring strikes of the region. Among the machinery recovered was a two-cylinder vertical pump, believed to have been one of the first machines made by the Crawford & McCrimmon shops, of Brazil. It was in a good state of preservation and will be placed in the county museum.

CHARLES E. BOCKUS, president, Clinchfield Coal Corporation, has been made a member of the natural resources production committee of the Chamber of Commerce of the United States.

DR. STEPHEN P. BURKE, formerly president of Fairmont Coals, Inc., and chairman of the committee on price proposals and classifications of District 3 Bituminous Producers' Board, is filling the post of visiting professor in engineering during the current academic year at Columbia University, New York City. He is maintaining his consulting practice at Washington, D. C., however, with his assistant in charge during his absence. At one time Dr. Burke was director of the industrial science division at West Virginia University, subsequently joining the staff of the Consolidation Coal Co. in the capacity of director of technical research.

G. P. COCHRAN, of Rox & Co. Traffic Bureau, Birmingham, Ala., has been appointed traffic manager for the Woodward Iron Co., Woodward, Ala., vice W. B. Lewis, deceased.

B. G. CULVERHOUSE has been made mine foreman at the Summit mine of the Alta Coal Co., Inc., Summiton, Ala. He formerly was safety inspector for the DeBardeleben Coal Corporation.

LEO CUTLIFFE has been named traffic manager by the Alabama By-Products Corporation, Birmingham, Ala., succeeding ARTHUR M. RIBE, who resigned to accept a connection with the A. J. Ribe Co. Traffic Bureau.

W. WALLACE DARTNELL has been engaged as superintendent of the Gibson mine of the Hillman Coal & Coke Co., Bentleyville, Pa. He was formerly with the Valley Camp Coal Co. and later with the Sullivan Machinery Co.

GILBERT C. DAVIS, hitherto manager of the Stag Canon Branch, Phelps Dodge Corporation, at Dawson, N. M., has been transferred by the company to Arizona as assistant to the general manager, with headquarters at Clifton.

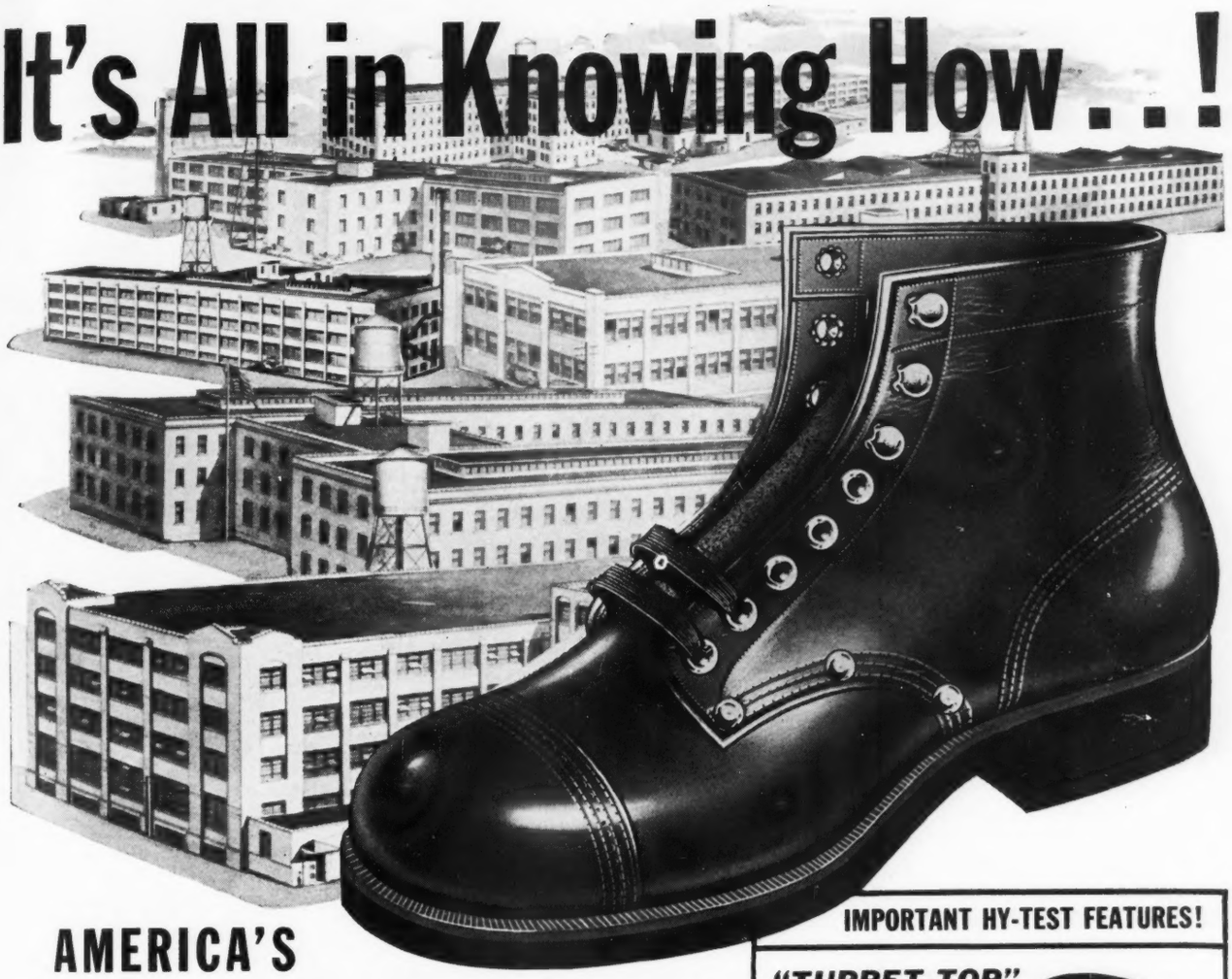
ROBERT DOUGHERTY, inside superintendent of the Cranberry Improvement Co. colliery at Hazleton, Pa., for the last three years, has been engaged as general superintendent by the Payne Coal Co., whose colliery, the Exeter, is at Pittston, Pa. His new connection is scheduled to become effective Nov. 1.

GEORGE DUCKWORTH has been appointed secretary of the Iowa Board of Mine Inspectors for a term of four years. He succeeds Phil Clarkson, who resigned last summer. Beginning in 1911, he served sixteen years as secretary of the Centerville (Iowa) local, United Mine Workers, then becoming secretary of the Centerville Chamber of Commerce.

JAMES D. FRANCIS, president, Island Creek Coal Co., has been appointed to the committee on regulation of competition of the Chamber of Commerce of the United States.

CLIFFORD GOODWIN has been placed in charge of Sahara Mine No. 4, the second

It's All in Knowing How . . !



AMERICA'S LARGEST SHOE MANUFACTURER MAKES HY-TEST SAFETY SHOES!

There is no substitute for experience when it comes to making shoes. And, when you supply your miners with Hy-Test Safety Shoes, you are supplying them with the ultimate in safety, in comfort, in appearance, and in VALUE!

For Hy-Test Safety Shoes are the product of what is probably the world's broadest shoe-making experience, combined with America's largest shoe-building resources: 44 shoe factories! . . a group of tanneries!..a rubber plant!..a cotton mill!..and the huge warehouses and service offices of the International Shoe Company.

Is it any wonder, then, that Hy-Test's offer unsurpassed value? Is it any wonder that they are America's largest-selling safety shoes?

If you are not getting 100% co-operation with your safety shoe program, introduce your miners to Hy-Test. Watch the enthusiastic acceptance!

IMPORTANT HY-TEST FEATURES!

"TURRET-TOP" SAFETY

Every Hy-Test Safety Shoe has this extra-gauge steel toe cap with the patented anchor flange. The deep flange prevents the cap from flattening under terrific blows.

"SAF-EZE" COMFORT...

Many Hy-Test models have the "Saf-eze" one-piece back. It provides foot-conforming comfort, flexibility, and longer wear.

1. No ripping.
2. No binding.
3. No rubbing.

HY-TEST INTERNATIONAL SHOE CO. SAFETY SHOES

HY-TEST SAFETY SHOES

Designed and Manufactured Exclusively by Hy-Test Division,
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slope operation to be driven recently by the Sahara Coal Co., Harrisburg, Ill. The company expects to recover through this mine much coal from the No. 3 property, which was flooded from the swollen Ohio River in 1937.

A. T. HANNETT, former Governor of New Mexico, is the new president of the Diamond Coal Co., Gallup, N. M. He succeeds B. B. Hanger, who has relinquished his interest in the company. E. A. ROBERTSON has been made secretary-treasurer, vice B. B. Hanger, Jr.

R. E. HOWE, president, Appalachian Coals, Inc., has been named to the natural resources production committee of the Chamber of Commerce of the United States.

GEORGE H. JONES, general superintendent of the Stevens Coal Co., Wilkes-Baare, Pa., has been made general manager of the company.

R. F. KIRKWOOD, formerly mine foreman, has been made superintendent of the Summit mine of the Alta Coal Co., Inc., Summiton, Ala.

JOHN M. MEIGHAN has been named executive secretary of the Anthracite Operators' Association, with offices in the Miners National Bank Building, Wilkes-Barre, Pa. The association represents about 80 per cent of the independent hard-coal producers. Mr. Meighan has had many years' experience in handling industrial matters before various governmental agencies.

HARLOW B. MONDEY has become a member of the marketing division staff of Appalachian Coals, Inc., in Cincinnati, Ohio. He joined the Columbus Mining Co. in 1921 as Eastern sales manager; became vice-president of the Central Fuel Corporation in 1927, and became associated with the Elk Horn Coal Corporation at the beginning of this year as assistant to the president.

J. D. PARKER, for many years in charge of safety for the U. S. Bureau of Mines at Salt Lake City, Utah, has been appointed assistant to D. Harrington, chief of health and safety for the Bureau, at College Park, Md.

LEO N. PLEIN, a member of the Coal Economics Division of the U. S. Bureau of Mines for many years and later with the National Bituminous Coal Commission and the Bituminous Coal Division of the Department of the Interior, is now engineering examiner in the mining section of the Reconstruction Finance Corporation.

CHARLES POMPEY has been elected president of the Pompey Coal Co. and the Supreme Coal Preparation Co., Scranton, Pa., vice Frank Passarelli, deceased. Mr. Pompey was vice-president and one of the organizers of the Pompey company.

JAMES J. RUDDY, Fairmont, W. Va., has been appointed engineer for the Sitnek interests, which operate the Katherine Coal Mining Co. and Taggert Coal Co. Mr. Ruddy resigned as district maintenance engineer of the State Road Commission to make his new connection.

H. P. SIBERT has been appointed traffic manager by the Alabama Mining Institute, vice W. B. Lewis, deceased.

PAGE R. L. SMITH tendered his resignation as president of the Virginia Land & Minerals Corporation, operating a mine six miles west of Richmond, Va., on Oct. 17. His action was due to ill health.

THOMAS A. STROUP, mining and mechanical engineer, West Virginia Coal & Coke Corporation, Omar, W. Va., has been named assistant to the vice-president in charge of operation.

JOHN IRA THOMAS, whose post as Secretary of Mines of Pennsylvania had been considered temporary since the election of Governor James, will "stay in his job," according to a statement by the Keystone executive on Oct. 12. Governor James added that he intended to "broaden the scope" of the department to make it more than "simply an inspection department."

J. W. WOOMER, mining engineer, Hanna Coal Co., St. Clairsville, Ohio, has severed his connection with that company and joined the staff of the Warner Collieries Co.

Bootleggers and the Law

Bootleg mining in the anthracite fields of Pennsylvania is causing peculiar legal developments. A case in point was the "march" of about 150 free-lance miners to the Schuylkill County Court House early in October to present a demand that the county authorities stop stripping operations which they said were endangering the county's mining industry.

In another instance there was a separately planned march of another group of "independent" miners at Swatara, near Branchdale, to block a projected stripping operation on a tract owned by Renninger Brothers, of that community. In connection with the latter, it was reported that the Schuylkill County Court had on the previous day announced indefinite postponement of hearings in injunction proceedings brought by the Renninger Brothers Coal Co. against a group of independent miners and their wives in that area.

Denies 6-Day Week Request

Pointing out that the wage agreement permits operations for an extra day each week only during the period from Nov. 1 to April 30 in each contract year, M. J. Kosik, president of District 1, United Mine Workers, stated on Sept. 29 that he had denied the request of a number of producers in the Pennsylvania anthracite region for permission to operate six days beginning the last week in September.

President Kosik said he regretted "having to refuse requests of many coal companies that they be permitted to operate six days because of the heavy demand for coal, but my hands are tied and there isn't a thing that can be done about lowering the bars unless it be done by the permanent committee of twelve operators and union leaders, which is not scheduled to meet again until Dec. 3. If the demand makes it necessary for companies to operate six days during October, the joint committee can be called into special session to grant them the permission."

Adequate Voltage Essential In Mine Haulage

Good track, efficient locomotives, adequate mine-car capacity and proper haulageway layout all contribute to efficient mine haulage. But there is one factor, declared L. W. Birch, transportation engineer, Ohio Brass Co., addressing the meeting of the Mining Electrical Group of Southern Illinois at West Frankfort, Oct. 6, that can slow up operation and boost the cost of haulage quicker than almost anything else. That is low voltage. Good voltage is as vital to an electric system as water pressure is to fire fighting; it furnishes the snap, the pick-up, to electric haulage and the maintenance of train schedules.

The electric circuit is important from the viewpoint of capacity, leakage and construction materials. Capacity, explained Mr. Birch, is governed by the size of rails, the quantity of copper and the efficiency of bonding. It is customary to install bonds of about 35 per cent of rail capacity. Even one poor bond may account for an abnormal voltage loss. There is a point in conductor capacity where the delivered kw.-hr. cost is a minimum. More or less capacity is undesirable, since fixed charges on conductor cost may outrun the savings in power losses. Low haulage costs demand a balance of the savings possible and their investment costs.

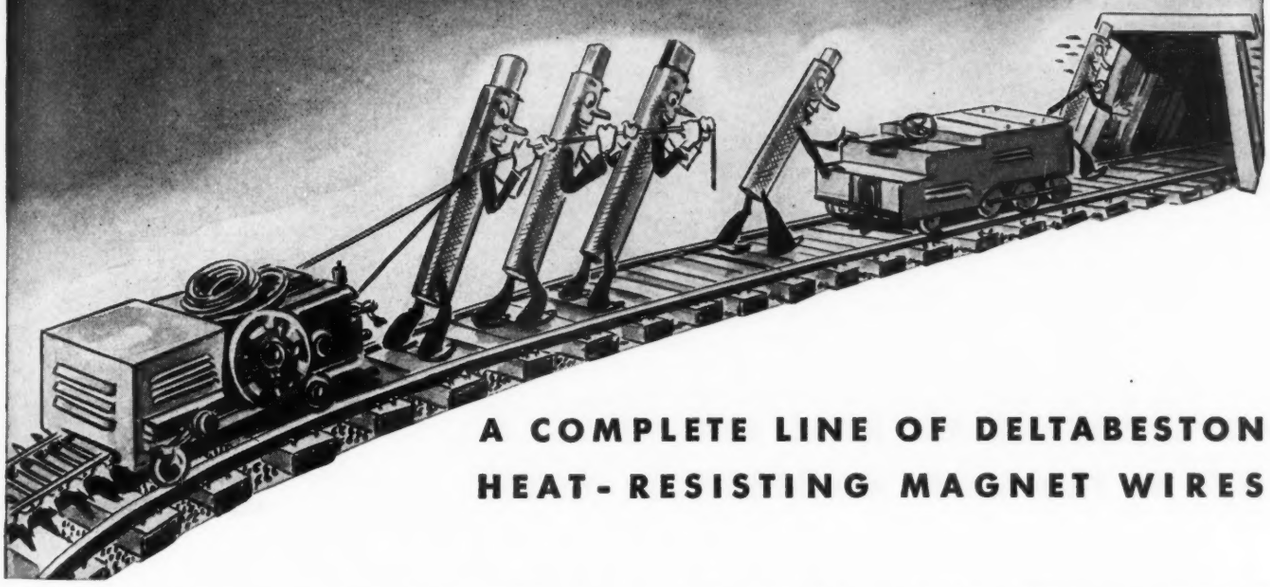
Leakage of Insulators Important

Leakage of hanger and other insulators is important from two angles: loss of power and damage of insulation. Normally, leakage probably is not a great factor. It usually is remedied in wet mines by making the leakage path long; i.e., by adding more insulators in series. Insulators from flooded mines have had their usefulness entirely renewed by having all the moisture wiped off. Leakage cannot be entirely eliminated. The maximum permissible leakage per insulator is about 50 milliamperes. More than that will cause a charred path to be burned across the insulation. The heat generated may eventually seal up the charred path and stop the leakage—dependent on the type of insulating compound used.

In making insulating compounds for line-material devices, a balance is maintained in the materials to control dielectric strength, temperature necessary for molding, mechanical strength and moisture absorption. Good insulators require all these characteristics to be able to stand up under mine conditions. Shellac-base insulating compounds bleach to a light color, due to light. This is only skin deep and does not affect either mechanical or electrical characteristics.

Wood stick insulators are made from

MORE HELP FOR YOUR MINE MOTORS!



A COMPLETE LINE OF DELTABESTON HEAT-RESISTING MAGNET WIRES

There are plenty of reasons why Deltabeston Magnet Wires improve the service and dependability of mine motors. Carefully applied insulation doesn't crack or break. Severe heat doesn't cause electrical breakdowns — doesn't impair the operation of important equipment.

Asbestos Insulation on *Deltabeston Magnet Wire* is "Purified". Harmful organic materials are removed. Moreover, insulation is "Felted" around the conductor — isn't damaged by sharp bends and turns. Installations can be made easily — quickly — efficiently.

The new "*Deltaglass*" *Magnet Wire* is insulated with glass fibers. Insulation is treated with a special varnish to resist moisture and abrasion.

IF YOU BUY READY-MADE COILS

Wherever and whenever your requirements call for Class B Insulation, specify Deltabeston-wound coils. Your motors won't be interrupted by high temperatures. Oil and moisture won't cause costly failures.

SEND FOR SAMPLES

Mail the coupon for samples and information on Deltabeston Asbestos-insulated Magnet Wire or the new "Deltaglass" Magnet Wire. A complete line of both types is distributed by General Electric Merchandise Distributors and Graybar Electric Company.

CAN YOU ANSWER THESE QUESTIONS ABOUT GLASS INSULATION?

Can glass-insulated conductors be used where moisture is present?
What's the most important factor in the construction of glass-insulated magnet wire?
Will glass fibers resist high temperatures?

THESE QUESTIONS — AND MANY MORE — ARE ANSWERED IN THE NEW BULLETIN ON "DELTAGLASS" MAGNET WIRE

SEND FOR IT TODAY

GENERAL ELECTRIC

second growth hickory. Rigid specifications are followed in the handling and inspection from forest to finished piece. As soon as cut, it is stacked up off the ground and the exposed ends are coated with "lignasau." To prevent attack by bacteria, in manufacturing, the timber is split to proper size for turning, kiln-dried to a constant moisture content and inspected for weight, ring growth and specific gravity. A definite weight is assigned to each finished stick.

Appearance is no criterion of the brashiness of wood, continued Mr. Birch. Weight and hardness are an indication. So specific gravity and Brinell tests are applied. Wood of less than 0.75 specific gravity, as well as wood having more than 20 rings of growth per lineal inch, is rejected. All wood is impregnated with an oxidizing oil and coated with spar varnish because buyers like to see the grain of the wood. Manufacturers would prefer to paint with glyptol because it has a life of four or more years, while the varnish begins to disappear in six to twelve months. All wood-strain insulators are tested to approximately half their breaking strength.

Present-day choice of metals going into the manufacture of haulage line material is based on experience. Bronze is used to resist the corroding effects of contaminated atmospheres. Stainless steel, to resist corrosion, must be heat-treated or highly polished. Fifteen years of service and tests point the way to the definite selection of suitable alloys to meet the various atmospheric, electrical and mechanical requirements of mine haulage.

The organization, now entering its third year, elected the following officers at the October meeting: C. C. Conway, mechanical superintendent, Consolidated Coal Co., president; Ralph R. Richart, electrical engineer, Union Colliery Co., secretary; C. A. Pittman, chief electrician No. 1 mine, Chicago, Wilmington & Franklin Coal Co., treasurer.

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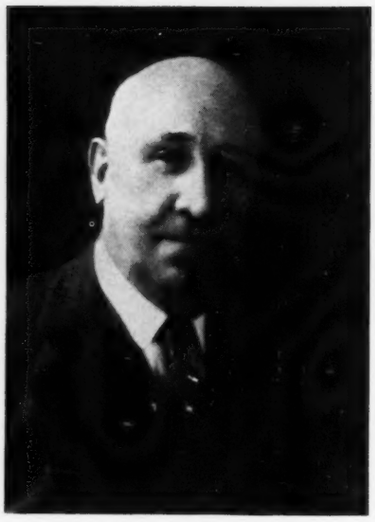
Obituary

JOSEPH F. DAVIES, 51, veteran mine safety instructor, who retired a year ago after 27 years with the U. S. Bureau of Mines, died Oct. 2 at his home in Norton, Va., after an illness of several years. Mr. Davies' activities in safety work covered Kansas, Indiana and several Midwest oil fields.

J. T. MORRIS, 58, formerly president and general manager of the Borderland Collieries Co., Borderland, W. Va., died Sept. 30 of injuries caused by his automobile skidding and overturning near Virgie, Ky.

W. B. LEWIS, traffic manager for the Alabama Mining Institute and Woodward Iron Co., died in a New Orleans (La.) hospital late in September. He had previously been traffic manager for the Sloss-Sheffield Steel & Iron Co. for a number of years.

A. J. MOORSHEAD, 86, former president of the Madison Coal Corporation, subsidiary of the Illinois Central R.R., died Oct. 16 at his home in La Jolla, Calif. Born in England, he came to this country



A. J. Moorshead

in 1873. Entering the railroad industry, he had wide experience before becoming head, in 1886, of the Mount Olive Coal & Coke Co., together with other companies that later became the Madison Coal Corporation. He was elected president of the Illinois Coal Operators' Association in 1909. He retired from active business in 1931.

GEORGE W. ST. CLAIR, 73, who played a conspicuous part in the development of the southwestern Virginia coal fields, died Oct. 19 at his home in Tazewell, Va. He was president of the Jewell Ridge Coal Corporation, Pocahontas Mining Co. and Virginia Smokeless Coal Co., the last named a selling organization. He had been in poor health for a year and a half, but continued to go to his office until a week before his death. A sudden heart attack carried him off.

D. FREDERICK HURD, 74, secretary-treasurer of the Ohio Coal Association and a fuel administrator during the World War, died Oct. 6 at his home in Cleveland, Ohio. He became interested in the coal industry in 1917 as secretary of the Pittsburgh Vein Operators' Association, later joining the Eastern Ohio Coal Operators' Association in a similar capacity.

CHARLES H. NESBITT, 67, mining and civil engineer, died in Birmingham, Ala., Oct. 2 after a brief illness. A graduate of Rose Polytechnic Institute, he began service as a mining engineer with the Galloway Coal Co. and was successively connected in the same capacity with the Miller Coal Co., Lacey Buek Coal & Iron Co., and Sloss-Sheffield Steel & Iron Co. He was chief inspector of the Alabama Mining Department for about twelve years prior to 1926, later joining the State Highway Department in the engineering corps.

W. C. MCCALL, 58, prominent as active engineer and consultant in many important mining developments in southern West Virginia, died Oct. 8 in a Huntington (W. Va.) hospital following a surgical operation. He went to Holden in 1902 as a chain bearer with a W. G. Wilkins Co. engineering gang taking part in the development of the Island Creek properties. Thereafter he continued in general engineering in association with the Wilkins office, taking over that company's business in 1913.

JOHN HUTCHINSON MCMILLAN, 56, well-known Canadian mining engineer, mine manager and inspector of mining properties, died Oct. 12 in Nanaimo, B. C. Coming from Scotland 35 years ago, he was mine manager at Cumberland, B. C., 1911-12; inspector of mines in the Prince Rupert (B. C.) district, 1913-16; and later general superintendent for the Cadomin Coal Co., Alberta, terminating his connection there in 1935.

WILLIAM KEMP VANDERPOEL, 58, international authority on transmission and power-distribution problems and vice-president of the Okonite Co. and the Okonite-Callender Cable Co., died Oct. 21 at his home in South Orange, N. J., after a short illness. His association with the Okonite Co. began in 1926, when he was elected vice-president and executive engineer.

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Big Sandy Safety Meet Brings Big Turnout

More than thirty teams took part in the mine-rescue and first-aid contests that featured the Big Sandy-Elkhorn Coal Mining Institute's annual safety day, held Sept. 23 at Pikeville, Ky. In the mine-rescue event, the Eastern Coal Corporation team captured first place with 60.5 points; second, Consolidation Coal Co., 56 points; third, Inland Steel Co., 55 points. The winner received a silver loving cup donated by the Mine Safety Appliances Co. and $150; second and third got $125 and $100, respectively.

With 24 teams entered in the first-aid contest (white group), the winner was Consolidation Coal Co. Mine 204-7 group; second, the same company's Mine 214 team; third, Mine 206 team from the same company; fourth, South-East Coal Co.'s Seco mine team; fifth, Inland Steel Co., sixth, Turner Elkhorn Mining Co., seventh, Consolidation Coal Co. Mine 155. The John F. Daniel trophy, a silver loving cup, and $150 went to the winner, with cash prizes to the following six. Consolidation teams took first and second in the event for colored groups, and the Inland Steel Co. team led the juniors. Red Cross medals also were given to the members of the adult winning teams.

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Reorganization Plan Approved

A plan for reorganization of the Charter Coal Co., Pittsburg, Ill., near Marion, which has been closed for five years, has been approved by U. S. District Court Judge Fred L. Wham. The arrangement proposes to issue 10,000 shares of stock at $100 a share in order to finance mining operations, which are to begin as soon as reorganization work is completed. Petition for corporate reorganization was filed by the company in April, 1938, and its officials were instructed to draft a plan. Judge Wham appointed these five

members of a reorganization committee to serve as a board of directors: C. G. Finch, O. E. Key, C. L. Waugh, E. W. Collar and William Pagenstecher.

More Anthracite Mines Ready to Produce

With increasing demand and output in the anthracite region of Pennsylvania additional mines are reopening and employment is gaining headway. Weston Dodson & Co., which recently leased Packer Nos. 2, 3 and 4 collieries from the Lehigh Valley Coal Co., has resumed operations at Nos. 2 and 4 and is preparing for production at No. 3 in the near future. Nearly 300 men have been put to work at the mines now operating and more will be taken on as production gains headway.

Park No. 1 colliery, near Mahanoy City, was opened by the Delano Anthracite Co. during the third week of October with 230 men at work. Its output will be prepared for market at the company's Springdale washery.

With its new breaker completed, the Maryd Mining Co., which has leased 1,380 acres of coal lands from the Lehigh Navigation Coal Co., expected to be in production by mid-October. P. J. McCall, former secretary to John S. Bush, personnel director in the administration of former Governor Earle, is president of the Maryd company.

Operations have been resumed also at the Alden colliery of the Alden Coal Co., Alden, after six months idleness due to labor trouble occasioned by a dual union movement.

After an idleness of six months, the Spencer colliery of the former Spencer Coal Co., Dunmore, reopened late in September with a force of about 150 men. The mine is now being operated by James Harper and Philip Costanzo.

Safety Conference Deferred

The Fifth International Conference on Mine Safety, scheduled to be held Sept. 25-30 at the Pittsburgh (Pa.) experiment Station of the U. S. Bureau of Mines (*Coal Age*, September, p. 70) has been indefinitely postponed because of the European war situation.

To Reopen Maitland Mine

Preliminary work was started early in October preparatory to reopening the Maitland mine, Ravenwood, Colo. The mine, which previously had been operated by the Caliente Coal Co., has been leased to John Manka.

Independent Union Folds

The Independent Miners' Union, which had been operating for several years in Christian, Hopkins and Webster counties,

We're the Doctor

Each sizing operation given individual treatment

• Just as a Doctor treats each patient individually since each case is different . . . so do Jeffrey-Traylor engineers treat each screening operation since no two are alike.

We investigate your particular operation . . . study the physical make-up of your material, the desired efficiency, the tonnage to be screened and the economics of producing the finished product . . . and wherever possible we make an actual screen test so that we can specify the right screen for your individual needs. Jeffrey screens (patented) are good medicine for your sizing ills.

Our engineers know that under the pressure of more precise specifications the standards of sizing are going higher and higher . . . and they build screens accordingly. A complete line of single and double deck styles for accurate sizing, scalping, by-passing, rescreening and dedusting, and washing.

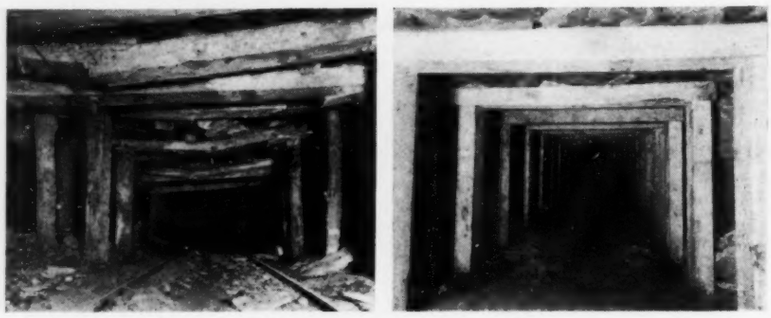
Send for Catalog No. 650—which fully describes Jeffrey-Traylor electric vibrating screens, feeders and conveyors.

JEFFREY-TRAYLOR DIVISION

THE JEFFREY MANUFACTURING COMPANY

912–99 North Fourth Street Columbus, Ohio

THIS? . . or . . THIS?



(Left) Untreated timbers failing in large Alabama coal mine after only 2 years' service. (Right) Osmose-treated timbers, installed by same operator, will last many times longer.

OSMOSE NATURAL PRESSURE TREATMENT

Increases Service Life of Mine Ties and Timbers At Least 3 to 5 Times

★ requires no special treating equipment. Application is as simple as whitewashing. Common labor does a thoroughly satisfactory job.

★ use ties and timbers available in vicinity of your mine. Treat them yourself (if you produce them) or buy them treated from nearby timber operators.

★ no need to buy select species of wood. Osmose-treated non-durable woods outlast untreated durable woods many times over. No need to season before treatment.

★ cost of Osmose treatment is only a fraction of pressure treatment, yet penetration is deep, effective, and lasting. *Write for detailed literature.*

OSMOSE WOOD PRESERVING CO., *of America, Inc.*

General Offices: 1437 Bailey Ave., Buffalo, N. Y.
Branch Office: 930 2nd Ave., N., Birmingham, Ala.

USE P-G RESISTORS

on your Locomotives, Loaders, and Mining Machines. Their use will enable you to reduce maintenance cost and increase production.

"The RESISTOR You Can INSTALL And FORGET"

90-Day Free Trial!

Guaranteed to give service!

THE POST-GLOVER ELECTRIC CO.
• ESTABLISHED 1892 •
221 WEST THIRD STREET, CINCINNATI, OHIO

Kentucky, was to be dissolved as of Oct. 31, according to an amendment to its charter filed Sept. 22 in the County Clerk's office at Madisonville. Dissolution follows its merger with the Progressive Mine Workers, District 5, on Aug. 20, 1938.

Stoker-Coal Research Program Planned by Koppers

A permanent program of investigation and research work in connection with stoker coals produced by the Koppers Coal Co. is announced by Walter Rothenhoefer, general manager of sales of the company. Walter Knox, formerly with the stoker division of Fairbanks, Morse & Co., Armour Institute and the Whiting Corporation, has been employed to carry on the work. He has had several years of practical heating experience and is a mechanical engineering graduate of the University of Illinois.

The project will be supervised by J. D. Doherty and will be an activity of the research and development division of the company, which is headed by Fred Denig, vice-president. A special laboratory for the work is being equipped at the Seaboard plant of the Koppers Co., Kearny, N. J.

The investigation will include studies to determine practical ways of eliminating common difficulties; study the adaptability of new coals for stoker use; make investigations of various types of treatment; determine the factors influencing coke formation; study means of controlling coking tendencies; determine fusion ranges suitable for domestic underfeed stokers; investigate effect of different feed and air settings upon individual coals; study overdraft needs of different coals; study means of minimizing or eliminating fly-ash. study the mixing of different coals toward improving burning characteristics; consider further improvement in preparation and sizing; accumulate actual data for some standardization of firing instructions and check burning characteristics of competitive coals.

Ohio Mines Resume

Big Run mine of the Rail & River Coal Co., near Bellaire, Ohio, resumed operations early in October after having been shut down for six months. Normal working force is close to 600 men and daily output is around 3,300 tons. Preparations also were under way late in September to reopen the Webb mine of the Cambria Collieries Co., south of Bellaire. It has a daily capacity of 3,500 tons.

Night Classes Resumed

The seventeenth consecutive year of night classes in coal-mining instruction in Maryland was instituted on Sept. 25. These classes are conducted under the auspices of the College of Engineering, University of Maryland; the State Board of Education, the County Boards of Education of Allegany and Garrett counties, and the Maryland Bureau of Mines. Voca-

tional Mining Instructor L. C. Hutson started classes in the Upper Potomac District and Assistant Vocational Mining Instructor R. D. Ewing opened in the lower Georges Creek district.

Heating-Ventilating Show Going Over Big

Increased activity in the leasing of space by exhibitors indicates lively interest in the Sixth International Heating and Ventilating Exposition, to be held in Lakeside Hall, Cleveland, Ohio, during the week of Jan. 22-26, 1940. This biennial event, started in 1930 in Philadelphia, Pa., is held under the auspices of the American Society of Heating and Ventilating Engineers in conjunction with its annual meeting. During the same week, the National Warm Air, Heating and Ventilating Association as well as the National Association of Sheet Metal Contractors will hold national meetings at Cleveland.

Among the exhibits, which will cover the entire field of manufacturing "weather" indoors, will be featured displays of all of the fuels used for home and commercial heating; studies of scientific combustion involving such factors as getting clean, high-grade fuel, burning it efficiently, regulating and recording combustion operations, and disposing of wastes. Stoker manufacturers bid fair to be better represented than ever before and most of them are planning to install operating exhibits.

New Firm to Open Mine

Interests of the George F. Lee Coal Co. in the Chauncey colliery, Plymouth, Pa., have been taken over by the Avondale Coal Co., organized by Fuller Reynolds, former superintendent at the colliery; Emil Rothman and George Cooper, the latter two connected with the Plymouth Excavating Co. The colliery has not been in full operation since April, 1938, when wage-rate disputes and other difficulties resulted in its being closed.

Industrial Notes

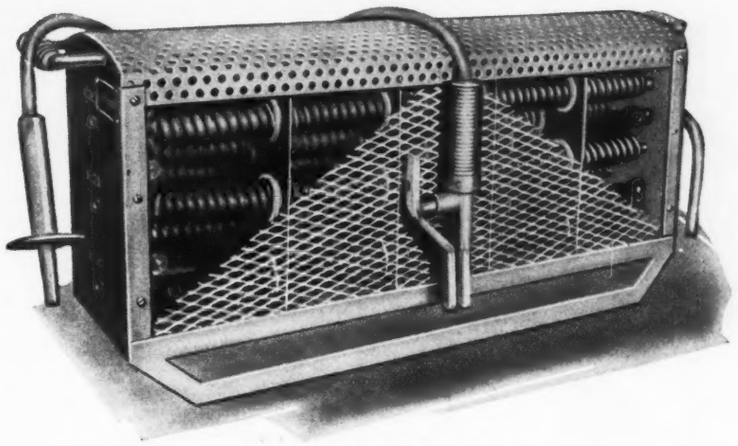
VIKING MFG. CO., Jackson, Mich., manufacturer of coal-treating equipment and package fuel machinery, has appointed Frank E. Snedecor as its representative in the Ohio, West Virginia and Southern coal districts, vice Harry E. Snedecor, deceased.

F. E. RHINE has resigned his position as service manager with the Joy Mfg. Co., Franklin, Pa., to become president of the Piasa Foundry Co., East Alton, Ill.

GENERAL ELECTRIC CO. has named F. A. Faron, manager of its New Haven (Conn.) office, and E. G. Dudley, of the industrial office, New York district, as assistant managers of the industrial department of the New York district of the company.

LINK-BELT CO. announces that Richard

PORTABLE D.C. ARC WELDER



Here is a PORTABLE D.C. ARC WELDER built for mine use.
RUGGEDLY CONSTRUCTED to withstand abusive handling.
MOUNTED ON RUNNERS so it can be dragged.
THIN to handle easy in close places (9¼" thick).
QUICK CHANGE TAPS, six sockets provide taps from 80 to 200 amperes.
HANDLES stay cool even after prolonged use of welder.

Write for details and prices

GUYAN MACHINERY COMPANY

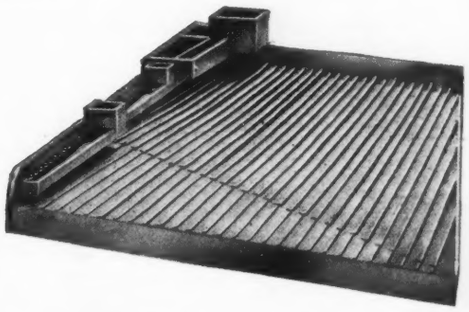
LOGAN, W. VA.

THE NEW DEISTER PLAT-O COAL WASHING TABLE . . .

Cleans much larger tonnages, effecting a marked saving in the space now required for this work.

New contour of the deck surface; new system of riffling; more effective differential action of the Plat-O Headmotion enable this table to handle much larger tonnages per unit of occupied floor space.

PLAT-O



COAL WASHING TABLE

Write for Bulletin 16-B

DEISTER MACHINE COMPANY

1933 E. WAYNE STREET (INCORPORATED 1912) FORT WAYNE, INDIANA

Cable Address "Deister"

EMIL DEISTER, SR., Pres. • I. F. DEISTER, V.Pres. • EMIL DEISTER, JR., Secy.-Treas.

Manufacturers of PLAT-O Coal Washing Tables, PLAT-O Ore Concentrating Tables, Heavy Duty PLAT-O Vibrating Screens, Deister Compound Funnel Classifiers.

THE BROWNIE
OIL SPRAY
SYSTEM

High Pressure Atomizing Eliminates Pre-Heating!

Spray oil—the most satisfactory material yet developed for dedusting coal—is applied without the necessity of heating.

The Brown-Fayro "cold oil" system is based on the use of a high pressure pump, with a buried storage tank and circulating loop to keep conditions uniform at the spray points. Impact type nozzles completely atomize the oil at pressures of 300 to 600 pounds per square inch.

With low pressure pumps it is necessary to heat the oil before it can be atomized, but the heat is rapidly dissipated in the spray and the oil is at air temperature when it reaches the coal.

The expense and fire hazard of heating equipment, unavoidable with low pressure pumps, are eliminated when The Brown-Fayro cold oil system is used.

Write Today—

—to get your copies of latest bulletins on the complete Brown-Fayro Line, designed and built for the Coal Mining Industry, including:

MINE CARS AND WHEELS
HOISTS • BLOWERS
RETARDERS • PUMPS
OIL SPRAY SYSTEMS
SHEAVES • RERAILERS

THE BROWN-FAYRO COMPANY
940 ASH ST.
JOHNSTOWN, PENNA.

W. Yerkes has resigned as secretary-treasurer after nearly half century's work for the company. Harry E. Kellogg has been elected to succeed him as treasurer and F. V. McArthur has been made secretary.

The board of directors of the WOOD PRESERVING CORPORATION, a Koppers Co. subsidiary, has approved the acquisition of the railroad-crosstie and other forest-products business of B. Johnson & Son, Richmond, Ind. B. N. Johnson and R. H. Johnson, who have been in active charge of the business in recent years, will become associated with the new owner. The Koppers concern has 22 wood-preserving plants throughout the United States and also owns tracts of timberland and operates woodworking plants where the timber is fabricated.

CUTLER-HAMMER, INC., has appointed H. E. Ankeney to take charge of the company's Indianapolis (Ind.) territory.

HEWITT RUBBER CORPORATION has appointed Arthur Purmort as district representative covering the St. Louis (Mo.) and Indianapolis (Ind.) territories.

NORMA-HOFFMANN BEARINGS CORPORATION, Stamford, Conn., has promoted C. W. Hedler, manager of distributors' sales, and R. L. Miller, both long-time members of its general sales staff, to assistant sales managers. Wesley G. Sargent, mechanical engineer, formerly with the Frick-Reid Supply Co., Pittsburgh, Pa., has been appointed assistant to Mr. Hedler, who will continue in charge of distributors' sales.

GOODMAN MFG. CO. has promoted W. T. Ferguson, formerly assistant manager, to manager of its Huntington (W. Va.) office, vice Wilbert A. Miller, who has retired after 35 years' service.

Crystal Mine to Reopen

Preparations were started late in September to open Crystal mine of the Hecla Coal & Coke Co., Gans, Pa. According to W. L. Affelder, vice-president in charge of operations, numerous repairs will be made which will put this mine, which has been idle for several years, on a production basis both on coal and coke.

Moffat Tipple Destroyed

The tipple of the Moffat Coal Co., Sparta, Ill,, was destroyed by fire which started late the night of Oct. 9. Fire departments from four surrounding towns saved the adjoining buildings.

W.V.U. Fellowships Continued

Two research fellowships at the School of Mines, West Virginia University, are being continued this year. Read Scollon, a graduate of Pennsylvania State College in fuel engineering in 1938, is again the recipient of a fellowship sponsored by the Calcium Chloride Association. Mr. Scollon, who held this fellowship last year, is working on the various uses of calcium chloride in connection with the coal industry. John L. Schroder, a graduate of West Virginia University School of Mines this year, is doing graduate work on mechanization of coal mining in West Virginia.

New Strip Mine Started

A small stripping operation is being opened by the Clyde E. Cox Coal Co., Marion, Ill., at the site of Watson Mine No. 2. A Koehring 3-yd. dragline stripping shovel and a 303 Koehring loading shovel have been delivered and put to work.

Rules on Shotfiring

Simultaneous discharges of more than one quantity of powder placed in different localities in the same mine constitute a single blast, according to an opinion by Attorney General John E. Cassidy of Illinois. If the total quantity of powder discharged exceeds 2 lb., regular mine firers must be employed to touch off the charge, he added. Any county mine inspector with written permission, said the Attorney General, may discharge any of the duties of a State mine inspector.

Kirkpatrick to Revamp P. & R.

Federal District Court Judge William H. Kirkpatrick, Philadelphia, Pa., was appointed on Sept. 28 to handle reorganization of the Philadelphia & Reading Coal & Iron Co. in place of Judge Oliver

Permissible Plates Issued

Six approvals of permissible equipment were issued by the U. S. Bureau of Mines in September, as follows:

Winchester Repeating Arms Co.: Winchester No. 2814 single-shot dry-cell blasting unit; Approval 1218; Sept. 7.

Winchester Repeating Arms Co.: Winchester No. 3214 single-shot dry-cell blasting unit; Approval 1219; Sept. 7.

Bond Electric Corporation: Bond No. 261 single-shot dry-cell blasting unit; Approval 1220; Sept. 7.

Bond Electric Corporation: Bond No. 317S single-shot dry-cell blasting unit; Approval 1221; Sept. 7.

Goodman Mfg. Co.: Type 460-B loader; two motors, 50- and 4-hp., 500 volts, d.c.; Approval 381-A; Sept. 12.

Goodman Mfg. Co.: Type 260-B loader (redesigned); four motors, 50-, 4-, 1½- and 1½-hp., 500 volts, d.c.; Approval 374-A; Sept. 20.

B. Dickinson, who died Sept. 16. The appointment was made at a private session of the judges of the District Court. Judge Kirkpatrick, who will take over the coal company litigation at a hearing Nov. 9, said he would devote the interim to a study of the complicated case.

New High in Bucket Size Set for Indiana Pit

A Marion stripping shovel with a 35- to 40-cu.yd. bucket is planned for the new mine being opened up near Dickeyville, Ind., by the recently organized Tecumseh Coal Co. Thirteen miles of track is being laid to reach the property, which lies about 10 miles northeast of Boonville. As announced last month (*Coal Age*, October, 1939, p. 80), a contract has been awarded to the McNally-Pittsburg Mfg. Corporation for the erection of a cleaning plant with a capacity of 1,000 tons per hour. Coal will be transported from the strip pit to the cleaning plant by truck haulage.

The Tecumseh Coal Co. is an affiliate of the Northern Illinois Coal Corporation and the Sunlight Coal Co. T. C. Mullins is president of all three companies; F. W. Kane is secretary. Headquarters of the new company are in Chicago. Operations at Tecumseh are expected to start about March 1, 1940.

Certificate Not Neccessary

The Northern Natural Gas Co. does not need a certificate to construct its Iowa-Minnesota natural-gas pipe line, according to a ruling by the Federal Power Commission. The company will spend $22,000,000 in constructing a line from Sioux City, Iowa, to Minneapolis, Minn. Protests were filed with the Power Commission by the National Coal Association, Illinois Coal Traffic Bureau and the Association of Railroads.

Trade Literature

ARC-WELDING—Lincoln Electric Co., Cleveland, Ohio. Bulletin 405, "101 Welding Ideas for Low-Cost Maintenance," illustrates and describes a wide variety of money-saving repair, fabrication and structural applications of arc-welding. Case studies of actual maintenance jobs show how general repair work on broken and worn parts—both structural and mechanical—also fabrication of replacements, piping, jigs, fixtures, etc., is done by the electric arc process. Welder Specification Bulletin No. 327A emphasizes salient features of the Type S-6055 "Shield-Arc" welder, diesel-engine-driven model, describing and giving specification of the diesel engine.

AUTOMATIC MOTOR CONTROL—Electric Controller & Mfg. Co., Cleveland, Ohio. Booklet 88 features control apparatus for various types of motors.

CARE OF TOOLS—Black & Decker Mfg. Co., Towson, Md. Booklet entitled "The Proper Care and Maintenance of Portable Electric Tools" gives helpful hints on care and maintenance, and also methods of properly grounding to protect the operator, currents, proper sizes of extension cable and pointers on what to look for when a tool fails to operate.

CENTRIFUGAL BLOWERS AND EXHAUSTERS—Roots-Connersville Blower Corporation, Connersville, Ind. Bulletin No. 120-B11 covers application, operating characteristics, construction and regulation of single- and double-stage units.

CONTROLS—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Descriptive Data 11-200 describes sizes 0 and 1 De-ion non-reversing linestarters designed for across-the-line starting of squirrel-cage induction motors and as primary switches for wound-rotor induction motors. Descriptive Data 36-160 is devoted to outdoor group-operated disconnecting switches having a vertical-break arrangement on each pole using three insulator stacks, one rotating to open and close the switch blade.

FACE SHIELDS — Boyer-Campbell Co., Detroit, Mich. Bulletin features seven models and fifteen different numbers, describing in complete detail the right face shield for the job.

FITTINGS FOR SMALL WELDED LINES—Crane Co., Chicago. Booklet entitled "New and Better Fitting for Small Welded Lines" graphically portrays products and uses, with photographs and drawings. Tables show hydrostatic burst-

Wire today

for free illustrated bulletin—gives descriptions of THE CINCINNATI Coal Drills.

The Cincinnati

ONE MAN COAL DRILL

● With one thought in mind—lowering drilling costs—this "One Man" coal drill was designed and constructed to give *more* power, "pound for pound" and *more* drilling efficiency "day after day". Used successfully in both bituminous and anthracite coal and sold on a complete "satisfaction or money back" guarantee.

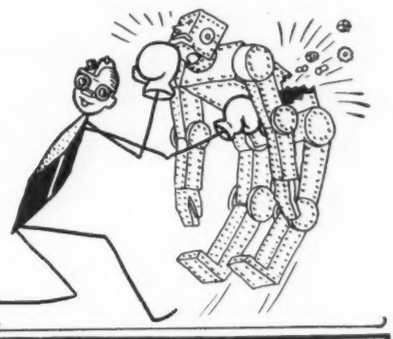
The Cincinnati Electrical Tool Co.

CINCINNATI Div. of The R. K. LeBlond Machine Tool Co. OHIO

JIM SLIM says:

WE'VE GOT BETTER THAN AN IRON CONSTITUTION . . .

ME AND BOWDIL CUTTER BARS*

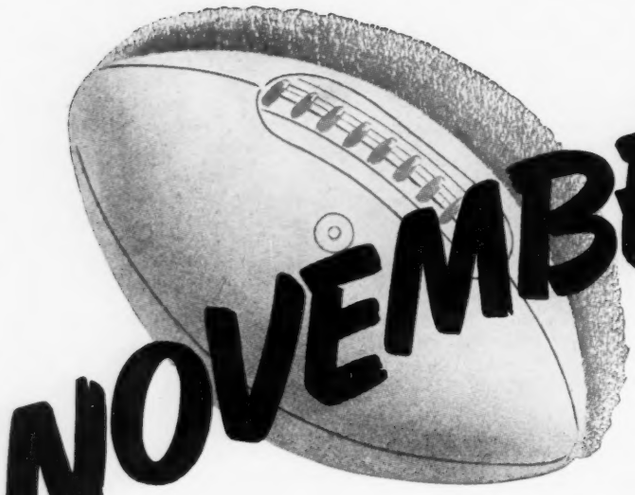


*". . . Of course, at first glance, we may not look as healthy as bigger guys, but don't let that deceive you . . . we make up for our skinnier frames with an extra store of longer-lived resistance (in the Bowdil Cutter Bar, it's solid, high-grade steel that does it). Then, too, we're loads faster on our feet . . . Bowdil Cutter Bars, for instance, get in 3 to 6 times more cutting, point for point! You ought to ask The Bowdil Company, Canton, Ohio, for details."

Jim Slim

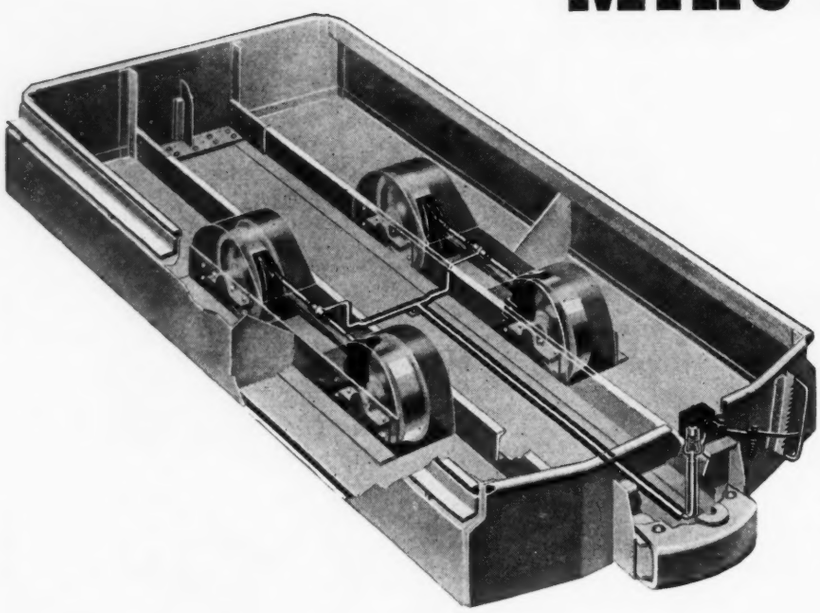
BOWDIL

COAL CUTTING EQUIPMENT



NOVEMBER NOTES

on Bethlehem Mine Equipment



Hydraulic brakes save on maintenance

A large mine using cars with Bethlehem hydraulic brakes reports that brake-maintenance costs on these cars average less than a tenth of that for other cars. During the first year, none of these cars were out of service for brake repairs, compared with several hours apiece for each car with mechanical brakes.

The explanation is in the extreme simplicity of the hydraulic braking system. Brakes are automatically self equalizing. Shoes cannot drag. Moving parts are minimized. Design is such that it is almost impossible for excessive slack to develop.

Hydraulic brakes can be built into any type of new car. They can be installed on practically any car now in service. They are easy to operate and have stopping power unequalled by ordinary brakes.

Hot-forging makes spikes hold better

Tests all indicate that hot-forged spikes grip the tie better than other types. The hot-forging operation produces a tightly adhering oxide coating. This coating, with its slight roughness, produces better adhesion, more friction, between steel and wood.

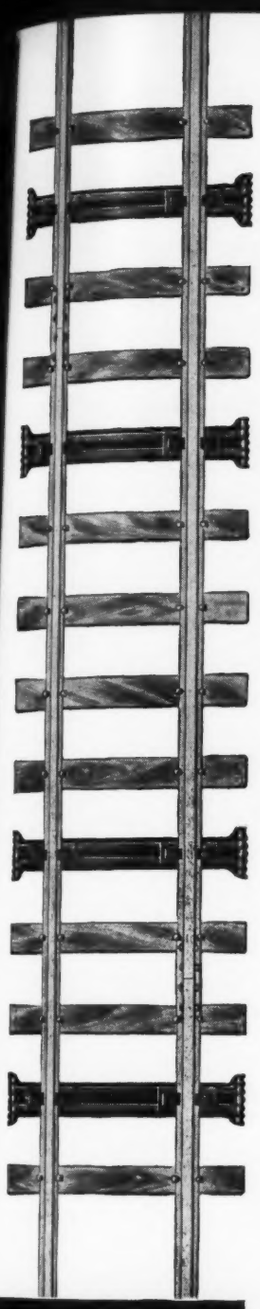
All Bethlehem track spikes, regardless of size, are made by the hot-forging process. They don't pull out easily. Therefore they reduce play and wear between rail and tie.

Hot-forging develops other advantages. Flow lines are continuous, producing toughness. The spikes are annealed by the forging heat—consequently internal stresses are minimized. Heads and points are full size. Heads will not fly off.

Bethlehem track spikes are liked by trackmen. They drive easily; they hold track down. Try them. You can identify these spikes by the "A" stamped on each head.

Bethlehem Products for the Mining Industry: Rails . . . Steel Ties . . . Frogs, Switches, Switch Stands, Turnouts and Special Trackwork . . . Track Bolts, Nuts, Spikes . . . Mine Cars . . . Wheels, Axles . . . Bars, Plates, Structural Shapes . . . Steel Construction . . . Steel Timbering . . . Pipe, Boiler Tubes . . . Galvanized Roofing, Siding . . . Wire, Nails, Fence . . . Wire Rope, Strand . . . Drill Steel . . . Forgings . . . Castings . . . Pig Iron.

BETHLEHEM STEEL



Gage of mainline track positively maintained with steel ties

While steel ties find their biggest use at or near the face, they do have a place on main-haulage track. As gage rods, they both support the track and maintain the gage.

Bethlehem particularly recommends the Keystone No. 6 tie for this type of installation. This tie, with its deep, heavy section, its depressed ends and its welded tie plates, fits well with wood ties and gives support and anchoring that cannot be secured by gage rods or lighter ties. Bolted clips, with self-locking nuts, give assurance of constant gage.

Steel ties are usually used on either side of each joint, preferably the second tie from the joint. This gives ample gaging action, and at the same time does not interfere with tamping of the joint ties.

Another important use of steel ties is at turnouts and crossovers of main-haulage track. Unless steel switch ties are used, there is a definite advantage to installing a steel tie directly ahead of each switch point. The gaging action of such ties increases safety.

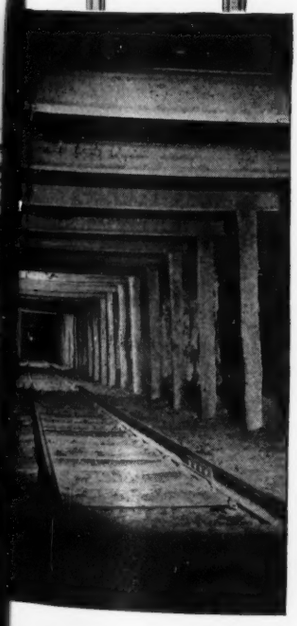
Bethanized wire rope... zinc-coated but tough

Since the first announcement of bethanized (electrolytically zinc-coated) wire rope was made, two principal questions have come to our attention: How much zinc does it carry? What is its strength?

Standard bethanized wire rope, selling at galvanized-rope prices, meets government coating-weight and quality specifications which can be met only by selected hot-galvanized rope. The bethanized coating is more uniform in thickness, consequently gives better protection. Where conditions justify it, ropes with heavier coatings can be provided.

Strength of bethanized rope meets or exceeds galvanized-rope specifications. And toughness, which is usually the most important factor in wire-rope life, is definitely greater than that of hot-galvanized rope and will always at least equal that of bright rope.

Bethanized rope can safely be used on any job requiring the endurance of bright rope. If corrosive conditions exist in your operations, we would like to consult with you on the advisability of using bethanized wire rope.



New steel timber is cheaper than relaying the rails

Where main-haulage ways are to be used for 15 to 20 years, steel timbering will generally be a good investment.

This statement, however, is based on new steel timber. Contrary to popular opinion, rails are generally not as economical. For example, an 8-inch, 17-pound-per-foot wide-flange beam will support approximately the same load, for a given fiber stress, as a 100-pound rail section (weighing almost twice as much).

Where a given size wood timber is known to be satisfactory, it is relatively simple to calculate the proper size of steel beam required. It is also possible to figure steel beams on load to be carried, if this can be estimated. In any case, feel free to call on Bethlehem engineers for suggestions and recommendations.

Turnouts ordered from one source save trouble

Recently our attention was called to a mine that was having difficulty with bent switch points. Investigation showed that while the points themselves were made correctly they were being used with non-standard heel plates.

This brings up the question of interchangeability of parts on turnouts. Bethlehem manufactures complete turnouts to A.M.C. standards. Individual points, switch plates, frogs, etc., are made to these same standards unless otherwise specified. They will give maximum service when installed to these standards.

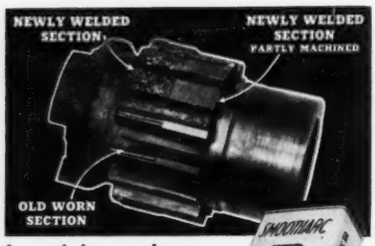
If you order complete turnouts from Bethlehem and keep all parts for these turnouts together—you will have no difficulty. Or, you can order all parts to A.M.C. standards. In either case, you take full advantage of the accurate design of reputable frog and switch material.

BETHLEHEM STEEL COMPANY

REPAIR and REBUILD

with welding

This worn-out pinion was reclaimed by welding at 1/6 of replacement cost. Welding procedure on this kind of work is yours for the asking.



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ing pressures, tensile pull tests and working pressures. Numerous drawings provide detailed measurements of the fittings.

BEARING LUBRICATION—U. S. Electric Motors, Inc., Los Angeles, Calif. Bulletin Form No. 1048 cites features and advantages of Lubriflush system of motor lubrication.

MOTORS AND TEXROPE DRIVES — Allis-Chalmers Mfg. Co., Milwaukee, Wis. Booklet B-6029 presents facts to help specifiers and buyers in estimating costs, types and sizes of drive equipment and motors to be used under various operating conditions.

PREPARATION EQUIPMENT—Deister Concentrator Co., Fort Wayne, Ind. Bulletin entitled "Men and Machines" outlines the caliber and experience of the men who design, develop and supervise the construction of its products and what the equipment does.

PILLOW BLOCKS, FLANGE UNITS AND TAKE-UP UNITS—Stephens-Adamson Mfg. Co., Aurora, Ill. Catalog 739 describes and pictures units for various applications, giving dimensions.

PIVOTED MOTOR BASES—Rockwood Mfg. Co., Indianapolis, Ind. Booklet 861 presents dimensional information as well as prices for all the various types of electric-motor and gas-engine bases available for different applications, with an understandable explanation of the basic principles underlying the operation of all pivoted drives.

ROCK DRILLS—Ingersoll-Rand Co., Phillipsburg, N. J. Catalog 4301 covers the company's complete line of rock drills and associated equipment, together with a brief history of rock-drill development; installation and shop views as well as tables of operating and physical characteristics for each class of machine are included.

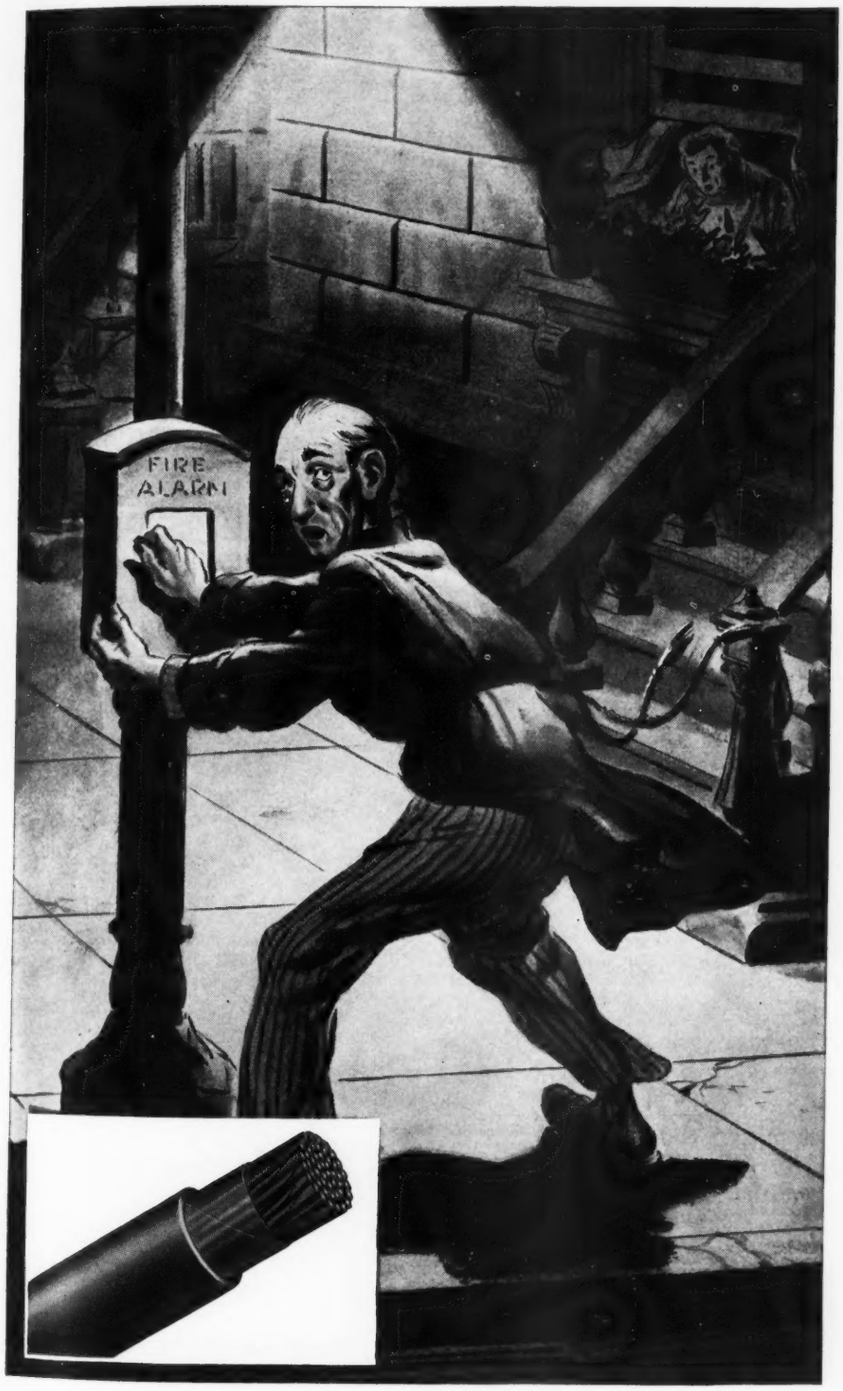
RUBBER INSULATION—Simplex Wire & Cable Co., Cambridge, Mass. Booklet cites characteristics and advantages of Anhydrex, a deproteinized rubber insulation for cables. Specifications showing water absorption, electrical properties, physical properties and elongation are given.

SAFETY EQUIPMENT—American Optical Co., Southbridge, Mass. Catalog describes in detail the company's complete line of eye, head and lung protective equipment, and also its new line of safety clothing. Among the items included are goggles for protection against impact, glare, splashes of liquids, particles of dust; welding helmets, face shields and respirators; safety gloves, suits, sleevelets, leggings, aprons, hats and hoods.

SCREENING MACHINERY—W. S. Tyler Co., Cleveland, Ohio. Bulletin 918 describes equipment for dependable sieve tests made on accurate screen scale testing sieves to check the fineness of materials, guard the quality of products and check grinding and screening operations. Bulletin 919 shows latest types of Tyles high-capacity screening machinery, suggesting ways of increasing output.

SCREENS—Robins Conveying Belt Co., New York City. Bulletin 107 shows in

From Fire Alarm Cable to



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word and picture its line of liquid screens, giving dimensions and weights.

SHAFT HOISTS—Sullivan Machinery Co., Michigan City, Ind. Bulletin 76-C is devoted to portable shaft, slope and supply hoists furnished in models for every type of shaft sinking, supply hoisting or materials lifting job.

SHOP TOOL—Templeton, Kenly & Co., Chicago. Bulletin P & P 40 shows the Util-A-Tool at work and describes the many jobs it performs, explaining in each case how the tool is used.

SHOVELS—Bucyrus-Erie Co., South Milwaukee, Wis. Bulletin 44-B1 explains features of the convertible 44-B 2-yd. unit; illustrations portray its structural and mechanical details.

SPEED CHANGER—Allis-Chalmers Mfg. Co., Milwaukee, Wis. Bulletin B-6013 shows by pictures and facts how Vari-Pitch speed changer units help in "keying production to profits." Installation views are given and several pages are devoted to shop-assembly pictures. Manual and electrical remote-controlled units, dimension sheets, horsepower and speed-range tables are covered.

STEELS—Joseph T. Ryerson & Son, Inc., Chicago. General data book contains metallurgical definitions, heat, hardness and numerical equivalent tables; carbon-steel, drill-rod, non-ferrous, tubing, sheet and manufacturing tolerances; also standard specifications for reinforcing bars, boiler tubes, plates, bridges, buildings; safe-load tables, etc.

STOP NUTS—Elastic Stop Nut Corporation, Elizabeth, N. J. Catalog explains graphically the elastic stop principle, giving comparative test data, suggestions on where stop nuts can be used to advantage, numerous illustrations of applications in various industries, and a complete listing of standard nuts available.

WATER-COOLED FURNACES — Babcock & Wilcox Co., New York City. Bulletin discusses the functions of water cooling for boiler furnaces, and describes and shows by illustrations interesting details of B&W water-cooled furnace constructions and varied typical applications.

Mine Accident Fatality Rate Shows Improved Trend

Accidents at coal mines in the United States caused the deaths of 64 bituminous and 15 anthracite miners in August last, according to reports furnished the U. S. Bureau of Mines by State mine inspectors. With a production of 34,470,000 tons, the accident death rate among bituminous miners was 1.86 per million tons, compared with 2.69 in the corresponding month of last year.

The anthracite fatality rate in August last was 3.91, based on an output of 3,835,000 tons, against 4.75 in August, 1938.

For the two industries combined, the death rate from accidents in August last was 2.06, compared with 2.87 a year earlier.

Fatalities during August last, by causes and States, as well as comparable rates for the first eight months of 1938 and 1939, are shown below:

UNITED STATES COAL-MINE FATALITIES IN AUGUST, 1939, BY CAUSES AND STATES

	Underground								Open-Cut and Surface				
State	Falls of Roof	Falls of Face	Haulage	Gas or Dust Explosions	Explosions	Electricity	Machinery	Other Causes	Total Underground	Railway cars	Electricity	Other Causes	Total Surface	Grand Total
Alabama	2	..	..	..	..	..	1	..	3	..	..	..	..	3
Illinois	5	..	..	..	..	1	..	..	6	..	..	..	..	6
Iowa	1	..	..	..	..	..	..	..	1	..	..	..	..	1
Kansas	2	..	..	..	..	..	..	..	2	..	..	..	..	2
Kentucky	4	..	4	..	..	..	..	..	8	1	..	..	1	9
North Dakota	..	..	..	..	..	..	..	..	..	..	1	..	1	1
Ohio	2	..	3	..	1	..	..	..	6	..	..	..	..	6
Pennsylvania (bit.)	7	..	2	..	..	..	1	1	11	..	..	..	..	11
Tennessee	2	..	..	..	..	..	..	..	2	..	..	..	..	2
Utah	..	1	..	..	..	..	..	..	1	..	..	..	..	1
Virginia	1	..	..	..	..	1	..	..	2	..	..	..	..	2
Washington	..	..	1	..	..	..	..	..	1	..	..	..	..	1
West Virginia	15	..	3	..	..	1	..	..	19	..	..	..	..	19
Total (bituminous)	41	1	13	..	1	3	2	1	62	1	1	..	2	64
Pennsylvania (anthracite)	5	..	4	1	2	1	..	..	13	..	1	1	2	15
Grand total	46	1	17	1	3	4	2	1	75	1	2	1	4	79

FATALITIES AND DEATH RATES AT UNITED STATES COAL MINES, BY CAUSES*

January–August, 1938 and 1939

	Bituminous				Anthracite				Total			
	Number Killed		Killed per Million Tons		Number Killed		Killed per Million Tons		Number Killed		Killed per Million Tons	
Cause	1938	1939	1938	1939	1938	1939	1938	1939	1938	1939	1938	1939
Underground:												
Falls of roof and coal	289	259	1.426	1.152	88	78	2.915	2.341	377	337	1.619	1.305
Haulage	93	79	.459	.351	15	17	.497	.511	108	96	.464	.372
Gas or dust explosions:												
Local	17	6	.084	.027	2	2	.066	.060	19	8	.082	.031
Major	60	28	.296	.124	18	...	.596	.....	78	28	.335	.108
Explosives	17	6	.084	.027	9	12	.298	.360	26	18	.112	.070
Electricity	27	24	.133	.107	2	2	.066	.060	29	26	.124	.101
Machinery	12	13	.059	.058	...	...	.....	.....	12	13	.051	.050
Shaft	3	2	.015	.009	3	4	.099	.120	6	6	.026	.023
Miscellaneous	13	8	.064	.035	9	8	.298	.240	22	16	.094	.062
Stripping or open-cut	5	4	.024	.018	8	4	.265	.120	13	8	.056	.031
Surface	20	16	.099	.071	7	11	.232	.330	27	27	.116	.105
Total	556	445	2.743	1.979	161	138	5.332	4.142	717	583	3.079	2.258

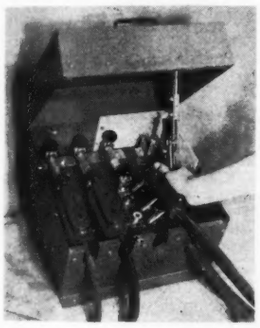
*All figures subject to revision.

WHAT'S NEW

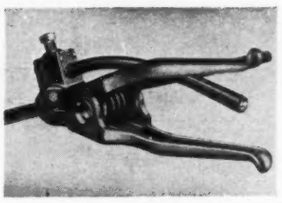
In Coal-Mining Equipment

INTERLOCKING JUNCTION; CLAMP; TROLLEY TAP

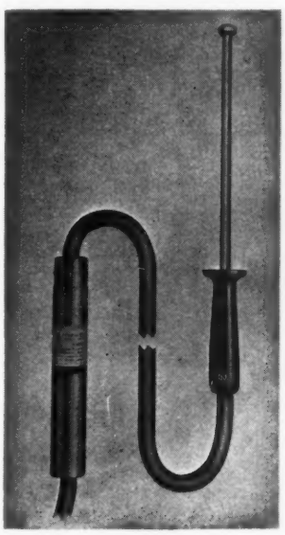
Ohio Brass Co., Mansfield, Ohio, has developed a new Type B interlocking junction for making d.c. trailing-cable connections with the power off. A quick-break switch is interlocked with the case so that the case cannot be opened and connections cannot be made with the power on. Fuse protection is provided for each of the three machine circuits which the junction accommodates. Provision for a ground circuit is included so that the entire device may be grounded for additional protection. Trailing cables from machines are clamped in molded-rubber hand grips. Each of the three hand grips has three split phosphor-bronze plugs so arranged that the plugs cannot be inserted in the wrong machine circuit. One plug makes contact with the positive line, one with the negative line, and one with the ground circuit. Mounted on a moistureproof insulating panel, the entire device is completely inclosed in a steel nongasproof case.



Ohio Brass also has introduced a new plier-type ground clamp designed to complete the ground or return circuit connection for portable electrically operated equipment. This device, known as the Type P ground clamp, provides a pair of plier-type jaws that grip the rail bond cable or may be easily attached to the rail base itself. The jaws are operated by a heavy steel spring. The negative or ground cable from the portable machine is clamped in an adjustable cable grip. Jaws and body of the clamp are made of high-strength bronze.

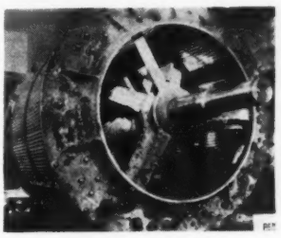


A new Type G fused trolley tap with double cable end likewise is offered by Ohio Brass. This provides a cable-clamping connection in each end of the tap so that a protective fuse may be placed directly in a trailing cable. In addition, a special rubber handle suitable for holding contact ball- or hook-type nips has been designed. The combination of these two items is said to offer more handling freedom and eliminate the necessity of holding the fused trolley tap in the hand while nipping along the trolley wire. When used with the contact ball nip, the nip and rubber handle may be inserted in the forked jaw of a special Bulldog clamp so that the locomotive may proceed into the room on cable reel.



COAL CRUSHER

A new coal breaker, the Bradmill, is offered by the Pennsylvania Crusher Co., Philadelphia, Pa. It is an improvement of the Bradford breaker, used for many years at coal mines, coke plants, power stations, etc., for reducing mine-run to a size determined by the screen perforations surrounding the breaker. According to the manufacturer, the new unit has all the Bradford advantages without the large size and large capital-investment disadvantages.



The Bradmill consists of a main shaft carried by two self-aligning bronze bushing bearings supported from suitable steel girders. Upon this shaft is rotated, through its independent chain drive, the Bradford cylinder, which operates at 16-28 r.p.m., depending on its diameter, and is equipped within the screen with a series of radial lifting shelves. The coal enters the cone-shaped spider at one end of this cylinder, the slack first screening out into the discharge hopper, while the lumps are carried up by the lifting shelves to the top of the breaker.

Upon the main shaft, which passes through the center of the cylinder, are mounted a series of four rows of rigid impact surfaces keyed to the shaft, which is in turn rotated by its own independent V-belt drive at a speed of 200-500 r.p.m. The coal on the lifting shelves of the cylinder falls upon the paddles and is broken by impact, the broken coal screening out as the cylinder rotates and the oversize being carried up for further reduction.

Bradmills are built in 4-, 5- and 7-ft. diameters, depending upon capacities desired and the size lumps to be fed to the unit.

—◈—

BALL-BEARING IDLER

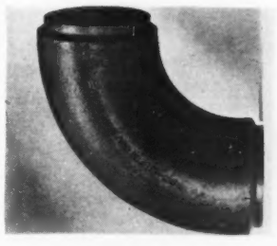
Chain Belt Co., Milwaukee, Wis., has developed a ball-bearing idler, designated as Type B-304, for handling materials of medium weight consisting of fines and small lumps. It is suitable for conveyor widths of 14 to 30 in. The idler rolls are made from 4-in.-diameter smooth-finished steel tubing with formed heads pressed into and welded to each end. The heads are ball-bearing equipped with effective sealing against dust and dirt by a combination labyrinth and composition seal.

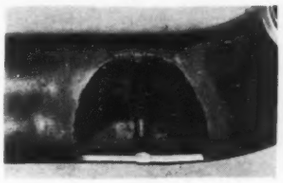
The rolls are rounded and smooth to prevent injury to conveyor belt and may be removed quickly. High-pressure lubrication is provided for either or both ends of the idler by means of button-head grease fittings which are regularly furnished. The troughing idler rolls are supported in strongly ribbed brackets of unbreakable malleable-iron construction. The brackets in turn are supported on an inverted angle base which is definitely self-cleaning with no shelves or pockets for dust accumulation.

—◈—

WELDING FITTING

A new type of seamless forged-steel welding fitting is offered by Taylor Forge & Pipe Works, Chicago, to supplement its line of WeldELLS. A feature of this fitting is the annular lip, which is forged integral with the fitting. By firmly centering the fitting in the pipe to which it is to be welded, says the manufacturer, the lip eliminates the need for backing rings, clamps and guides for holding the fitting in position,





and it is said to simplify and expedite pipe welding. Fittings having the self-centering lip or ring are to be known as "Centring" WeldELLS.

The manufacturer emphasizes that the ring remains cooler during the welding than the molten weld metal. As a result the bottom of the "V" appears darker than the sides, this color contrast permitting the welder to obtain complete penetration without burning through.

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WELDING-HEATING BLOWPIPE

Of late, the usefulness of the oxyacetylene flame for such metal-working operations as forging, forming, straightening, bending and pressing has been greatly increased by the availability of the large-capacity

heating blowpipe. This unit, distributed by the Linde Air Products Co., New York City, and known as the Oxweld (Type W-26) heavy-duty welding blowpipe, is for welding and heating ranges above those which can be handled by ordinary blowpipes. It delivers a tremendous amount of heat to a localized area and does it so quickly that metal-working and heat-treating can be accomplished at top speed.

Extensions for the welding head are available for extra-heavy work, doing away with the necessity for heat shields. The operator works in comfort, away from the source of heat, and finds the blowpipe, even with the extension, easy to handle because of its excellent balance.

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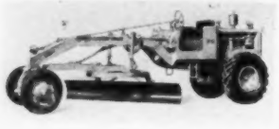
EARTH MOVERS; ENGINE; GENERATING UNITS

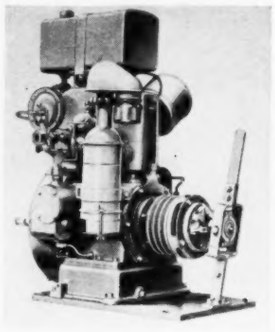
A 32-hp. motor grader, the No. 212, weighing about 10,500 lb. and available with either diesel or gasoline engine, is offered by Caterpillar Tractor Co., Peoria, Ill. Completing the "Caterpillar" line of all-purpose motor graders, the new machine has an over-all width of 6 ft. 8 in. and a 10-in blade that makes it suitable for use on narrow roads where traffic would find it difficult to pass a wider machine. A full revolving blade permits the machine to work in reverse, a useful



feature on short jobs or where turning is difficult or impossible. It is offered with single-drive only.

A new "Caterpillar" single-drum rear-mounted cable control is designed to offer new efficiency for the control of bulldozers, trailbuilders and similar single-cable-operated equipment. The control lever, located at the forward right-hand side of the operator, permits full attention to the work from a natural and comfortable position. With the lever in center position the drum is locked in neutral (brake on); drawn in toward the operator, the drum reels in cable; moved away from the operator, the drum allows cable to unreel. The lever position is adjustable to suit operator. Attachment or removal is quick and easy and all adjustments are external—easily accessible.

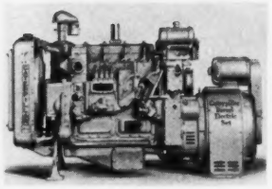
The "Caterpillar" 800G engine is a new machine designed for efficient service with a minimum of attention. A single-cylinder 5.5-hp. unit, it is said to be well suited for pumping jobs where horsepower



requirements are low. With no water to freeze or boil away and with an unusually large lubricating-oil sump, says the manufacturer, the new engine can run for long periods without attention. It is offered as a complete unit, equipped with "Caterpillar" clutch; is said to be more than adequately protected by an air cleaner, strongly constructed, and has a built-in governor.

Two new, completely self-contained diesel electric sets suited for service either as standby power or as a prime mover for many mine machines are announced by Caterpillar. Of 15- and 20-kw. capacity, these units, according to the manufacturer, can be set up and running in less than an hour after delivery. The only wire connections to be made are from the generator terminal to the circuit breaker and from the circuit breaker to the distribution box. No special bases are needed.

Two sizes are available: 34–15 and 44–20. The former



is suppled in 3-phase, 110, 220 or 440 volts at 15 kw., 0.8 power factor; also available as single-phase, 110/220 volts, three-wire type, and 110 and 220-volt, two-wire type, at 13 kw., 0.8 power factor. The 44–20 set is supplied in 3-phase, 110, 220 and 440 volts, at 20 kw., 0.8 power factor; also available single-phase 110/220 volts, three-wire type, and 110 and 220 volts, two-wire type, at 18.5 kw., 0.8 power factor.

—◈—

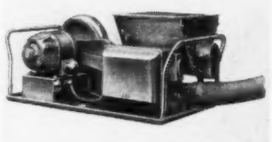
MINER'S CAP LAMP

A new miner's cap lamp has been introduced by the Portable Lamp & Equipment Co., Pittsburg, Pa. Powered by a 3-cell 6-volt battery, this lamp has an adjustable headpiece, a combination switch and charging plug, a slip-on belt loop, and the battery is equipped with standard gravity aircraft-type non-spill vents.

—◈—

AIDS TO SAFETY

A new M.S.A. semi-portable rock-dust distributor for use in trackless mines or sections, which can be easily transported by three different methods, is announced by Mine Safety Appliances Co., Pittsburgh, Pa. According to the manufacturer, it was designed to supplant the costly hand-dusting system used beyond the limits of the mine track by providing an efficient means of effective distribution with thorough mechanical application.

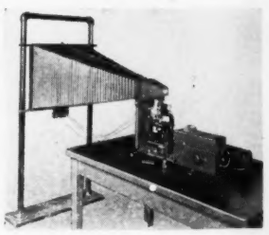


The machine may be carried on a belt conveyor, on a special M.S.A. demountable-type pneumatic-tired truck, or on a storage-battery shuttle car, taking its power directly from the batteries. The unit is powered by a 2-hp. 3,500-r.p.m. ball-bearing dustproof motor of non-permissible or permissible type, and can be furnished for any desired voltage. Rock dust is fed from the 80-lb.-capacity hopper into the throat of a special venturi tube by means of a screw conveyor and an agitator which rotate in ball bearings.

The M.S.A. artificial respiration trainer, designed to record accurately the work of each man learning the technique of manual resuscitation, indicates on a chart the actual performance of the operator—graphically recording the pressure applied at each forward stroke, the volume of air expelled by the patient's lungs, and timing

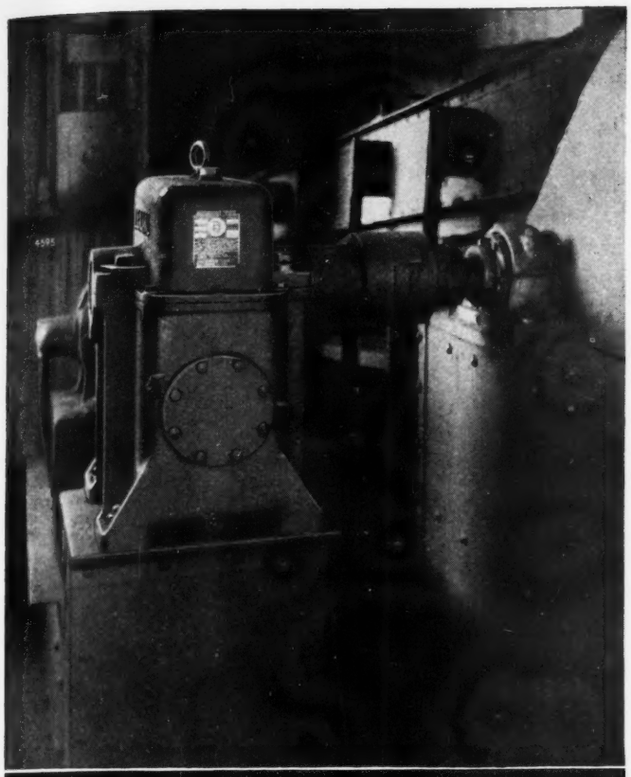
and rhythm. For men who are already trained, the apparatus provides a check on proficiency; with the trainer turned so that the operator cannot observe the chart, any errors in technique that may have crept into his application are plainly apparent as the record is made.

A new instrument for rapid, accurate, easy counting and size estimation of dust particles is offered by M.S.A. Known as the Microprojector, the new unit projects an image of a misroscope's field upon a ruled vertical translucent screen, providing a magnification of 1,000 diameters for counting and 10,000 diameters for particle-



size determination. For industrial processes where dust control is desirable for economical or health reasons, the unit is said to offer a rapid and accurate method of periodically checking dust conditions; with this outfit it is easy to tell whether dust collectors, ventilation systems, etc., are performing satisfactorily. It consists of an automatic-feed carbon arc lamp the light from which is reflected by the microscope's mirror up through the field to a right-angle projection prism fitted above the eyepiece. A large leatherette bellows is provided between the prism and the ruled screen, which is 50 mm. square. Remote controls enable the observer at the screen to focus the microscope and operate the mechanical stage.

M.S.A. also offers a new trolley-guard hangar said to give complete protection against mine trolley-wire hazards. Sim-



UNINTERRUPTED PRODUCTION

your reward for using

DE LAVAL WORM GEARS

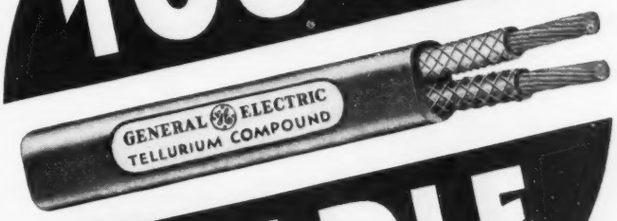
IN seeking to eliminate costly delays, plant managers strive to make every part of the equipment fool-proof and accident-proof. By selecting De Laval Worm Gears for the important power drives they insure continuous operation without breakdowns in spite of severe duty and unfavorable operating conditions, and with only occasional inspection of oil levels. This dependability results both from the use of best quality materials and perfected methods in the production of De Laval Gears and from the expert skill of the De Laval engineers in designing gears for, and fitting them to, the particular conditions under which they are to be operated.

A statement of your speed reducer requirements will be rewarded with pertinent data and well considered advice.

DE LAVAL
STEAM TURBINE CO.
TRENTON, N. J.

1108

TOUGH CABLE



for

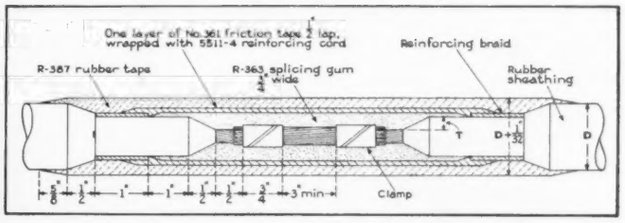
Has jacket like auto tire .... stands rough usage in mines and quarries

YOU'LL get a lot of wear out of any piece of G-E tellurium-rubber portable cable. Its over-all jacket is made the same way as the tread of an auto tire. Result: cable is tough, resists abrasion, and saves on repairs.

Electric shovels
Electric dredges
Mining machines
Reel locomotives
Arc welders
Cranes and hoists
Portable pumps, motors, compressors, riveting machines, and other portable equipment

Try it for such possible savings. Made in all standard types and sizes, many of which your G-E jobber carries in stock. Call on him.

Tip on how to make cable joints without soldering



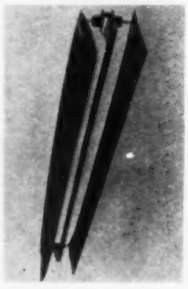
This method applies to single- and two-conductor types. It eliminates solder, and thus is suited for work that has to be done in a mine. Useful, also, for emergency repairs; joint is easily and simply made.

BULLETIN FREE. Instructions for making nonsoldered joints, as well as other portable-cable joints, are given in Bulletin GEA-2989. For a copy, see your G-E jobber, or address General Electric Co., Dept. 6—201, Schenectady, N. Y.

GENERAL ELECTRIC

520-173

ple in construction, the new unit is easy to install and can be attached to all sizes of trolley wire without alteration or change in the present trolley-wire installation. This hanger consists of two plates which clamp in the trolley-wire groove and are held firmly in place by



an insert screw. The plates support an insulated rigid wire, both ends of which are formed in U-shape. To each of these hooks is attached a 5-in.-wide rubber sheet which hangs at the side of the trolley wire.

The M.S.A. Explosimeter is a handy little instrument that can be carried in one's pocket and used to check easily and accurately for combustible gas concentrations. According to the manufacturer, testing atmospheres for explosibility with this new instrument means simply the turn of a single knob and a few quick strokes of the pump. The concentration of combustibles in relation to an explosive mixture is indicated on the meter—as easy to read as a watch.

Wide vision, comfort and efficiency are advantages claimed for the new M.S.A. all-vision facepiece announced as standard for all the company's lines of gas masks. In designing the new facepiece, extensive research was conducted to determine the most favorable size and shape of lenses in relation to the size and shape of facepiece to provide maximum usable lens area, restrict dead-air space to the minimum, prevent fogging of lenses, and keep weight as low as possible. The

reduced dead-air space cuts down rebreathing of exhaled air, thus reducing fatigue and decreasing the tendency to fog the lenses. The incoming air stream is directed over the entire area of the lens by means of a new type of deflector built integral with the facepiece, thereby preventing fogging. According to the manufacturer, an absolutely gas-tight fit has been provided for wearers having large or small, thin or full faces.

FLAME DESCALER

Air Reduction Sales Co., New York City, offers a new oxy-acetylene descaling apparatus to remove scale and similar accumulations from iron and steel by rapidly heating such deposits with the multi-flame tips. This causes cracking-off of scale as a result of the differential expansion between the scale and the base metal.

Where necessary, the apparatus is mounted on wheeled carriages for ease in travel across steel surfaces.

A secondary function is to drive out occluded moisture from within and beneath surface scale, leaving a warmed surface for painting. Immediately after the flame application the surface is wire-brushed and swept free of scale particles and dust, leaving a clean paint base.

BLASTING CAPS

A new electric blasting cap and a delay blasting cap sealed with rubber and equipped with plastic insulated wires are announced by E. I. du Pont de Nemours & Co., Wilmington, Del. The plastic insulation is of plasticized ethyl cellulose composition. The company states that this is the first time an electrical insulation of plastic extruded on wire has been marketed in this country.

Current leakage of the plastic-insulated wires, according to the manufacturer, will be no more than that of enameled wires, generally considered the best in this respect. The improved insulation, it adds, overcomes the difficulty sometimes experienced with the old cotton-insulated non-enameled wires when leakage was so great that the current reaching the caps was not sufficient to detonate them. Abrasion resistance of the plastic also is said to be greater than that of the cotton insulation, reducing the danger of short circuits which might cause failure of the caps to detonate. The smooth surface makes the wires easy to handle and saves time in making up the primers for a shot.

Instantaneous caps will be equipped with two red wires and the delay caps with one red and one yellow wire, making the wires easier to see, particularly in underground work.

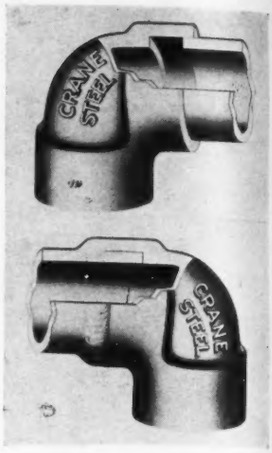
The new closure consists of a 7/16-in. rubber plug crimped into the copper cap shell, rubber having been found, it is said, to make a much more effective seal than the combination of sulphur and asphalt previously used. As a result, says the maker, the new rubber plug makes the caps more resistant to water than the special waterproof caps now on the market. Manufacture of the old special waterproofed caps will eventually be discontinued. The rubber plug will be used on all electric blasting caps and delay electric blasting caps.

The instantaneous caps will be $\frac{3}{4}$ in. shorter than the caps they displace and the delay caps $1\frac{1}{8}$ in. shorter, making it much easier to insert them in the dynamite cartridge. The new caps will have the same explosive charge as the old caps, but the maker says they will be more dependable, an important safety consideration because of the hazard of misfires.

SOCKET FITTING; PUMPS

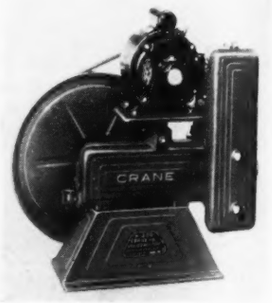
A new forged-steel-socket welding fitting introduced by Crane Co., Chicago, features a deep socket which is said to provide liberal come and go in the assembling of pipe; on installations where the pipe need not butt against the shoulder at the back of the socket, it is unnecessary for the welder to cut the pipe to accurate length or even to cut it off square; on installations where the pipe must butt against the shoulder, free uninterrupted flow can be assured conveniently.

According to the manufacturer, these fittings are not made from ordinary screwed fitting blanks but are especially designed with neat appearing bands only slightly larger than pipe. The socket wall is especially proportioned for welding, assuring uniform heat dis-



tribution and proper heat penetration.

Crane also offers a new line of shallow-well and deep-well pumps. The shallow-well units, referred to as the "Crane K Series," are offered in 250- and 375-gal.-per-hour sizes and in horizontal- and vertical-tank



systems. They are designed for 40-lb. maximum pressure with 22-ft. suction lift, having 1-in. suction and discharge. Three basic sections — the power frame, water end and base—are designed for accessibility.

The deep-well unit, designated the D-60, has a load-balancing cylinder and silent herringbone gears which contribute to quiet, economical operation. It is available with different sizes of load-balancing cylinders.

A McGRAW-HILL PUBLICATION

COAL AGE

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• DECEMBER 1939 •

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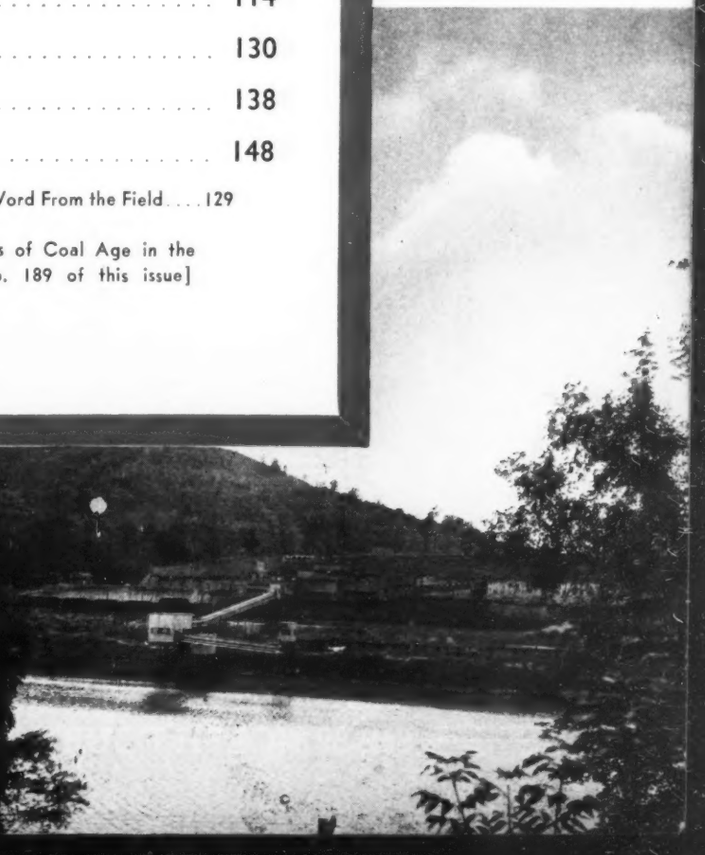

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JEFFREY EQUIPMENT A VITAL FACTOR

IN AN OUTSTANDING PRODUCING AREA

Only a small portion of the principal Jeffrey installations found in this year's "model mines" are shown on the opposite page . . . but they are typical of the many "fronts" on which Jeffrey can contribute lower operating costs, improved production and larger year-end earnings.

In West Virginia, as in every area distinguished for highly mechanized practices, the wide use of Jeffrey equipment and engineering service attests to our broad experience and intimate knowledge with operating requirements.

Beginning at the face and carrying through the various underground and surface operations, Jeffrey cutters, drills, loaders, conveyors, locomotives, fans and blowers, crushers, feeders, screens, jigs and washeries are proving their ability to reduce costs, either singly or collectively, on the leading properties in West Virginia.

Jeffrey can help you make substantial savings in every phase of mine operations, above or below ground. Complete units or replacement parts . . . ***be sure*** they're Jeffrey and ***be sure*** of low-cost production records for ***your*** mine.

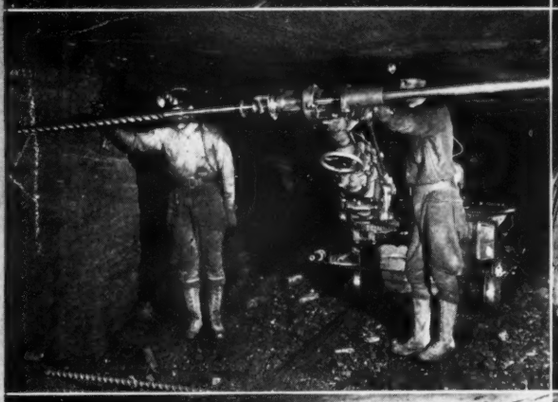
THE JEFFREY MANUFACTURING COMPANY

912-99 NORTH FOURTH STREET • COLUMBUS, OHIO

Jeffrey coal cutters are establishing records of low-cost production in 17 of the leading mechanized mines of northern West Virginia. Most of these units are 35-B, 35-BB, 29-C and 29-LE types as well as the big 29-U universal cutting and shearing machines. A Jeffrey 29-U universal and a 35-BB cutter are shown at the right.

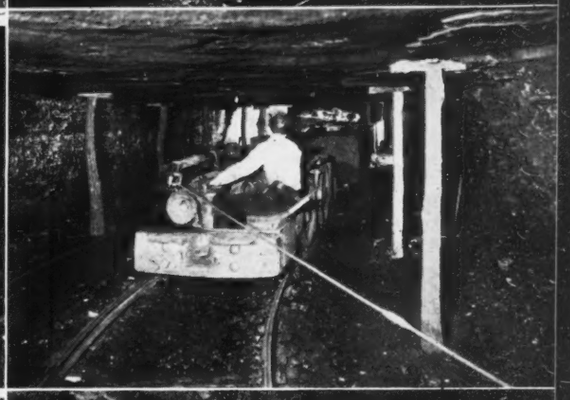
(Pat. & Pats. Pending. Also licensed under the patents of E. C. Morgan, Patents Nos. 1706961, 1706962, 1707132, 1707133, 1953325 and 1953326.)

Many Jeffrey electric coal drills — hand-held, post-mounted and track-mounted types, are being used in District No. 3. They are doing a nice job of it in these modern mines. The Jeffrey track-mounted drilling machine and an A-6 post-mounted drill are shown in operation at the right.



The Jeffrey L-400 Loader (right) is being rapidly adopted in those mines where big tonnage, coordination and successful "speed-up" of output is important. Jeffrey type 44-DD and 44-EE loading units are also being used.

In ten out of the 17 leading "model mines," there are many Jeffrey locomotives ranging from the 6-ton gathering types (right) to the big 40-ton tandem jobs used for heavy service in main line haulage. Jeffrey locomotives "shorten" the distance between face and tipple.

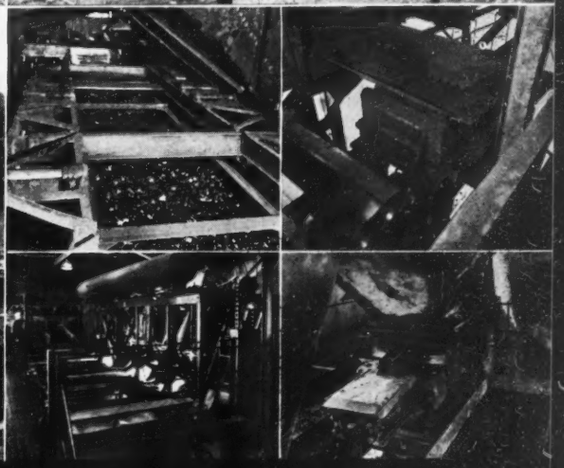


A Jeffrey 13-ton trolley locomotive is shown at the right. Units of this type are in constant service here as in other modern mines throughout the coal-producing areas.

Jeffrey fans and blowers are delivering large capacities of air at lower power cost in West Virginia. The Jeffrey Aerodyne (at far right) will maintain static efficiencies well over 80% when working over a wide range of duties. Increased ventilating efficiency and improved working conditions are very much in evidence in these "model mines."

Jeffrey designs, erects and equips the modern tipple to help meet the demands of an increasingly exacting market for better-prepared coal. A Jeffrey-equipped tipple with its preparation facilities is shown (right) as well as a crusher, feeder, coal-washing jig and screen. This Baum-type 3-compartment coal-cleaning system is cleaning 3/8" or 1/2" up to 5" coal. For the latest in preparation equipment . . . call in a Jeffrey engineer.

Jeffrey replacement parts are your assurance of the same dependability and economy in operation which has characterized Jeffrey mining equipment since 1877.



O-B salutes the Northern West Virginia field for its impressive cost record!

Our hats are off to the operators of northern West Virginia who have every right to be proud of their enviable record as the second lowest-cost producers in the country!

To the rest of the industry, that low-cost record is deeply significant. For profit margins are built on cost-reductions! Even more significant, to operators of electrified mines and those who are considering such electrification, is the predominance of O-B equipment serving these low-cost northern West Virginia mines.

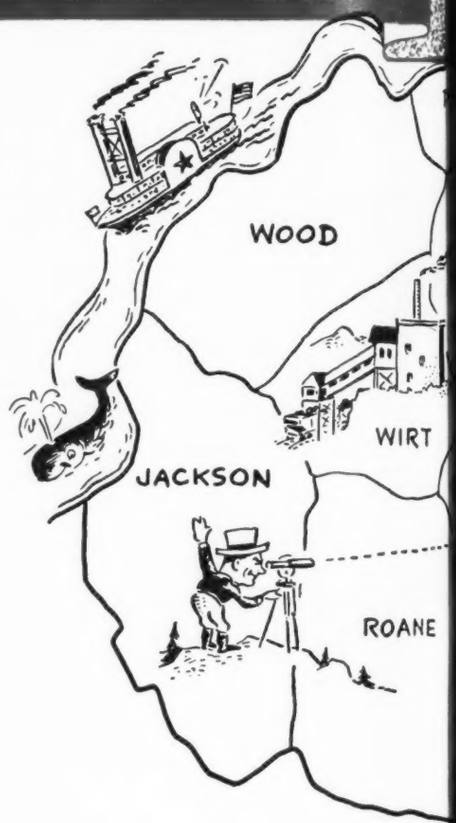
Like the unbroken string of Coal Age Model Operations in the past they, too, have seen fit to specify O-B overhead line materials, rail bonds, locomotive and control equipment. For O-B materials are "known quantities"! They're designed correctly, manufactured to rigid specifications. It's no wonder they last longer and do the job better! Ask your O-B representative to discuss your electrification problems the next time he drops in!

2118-M

OHIO BRASS

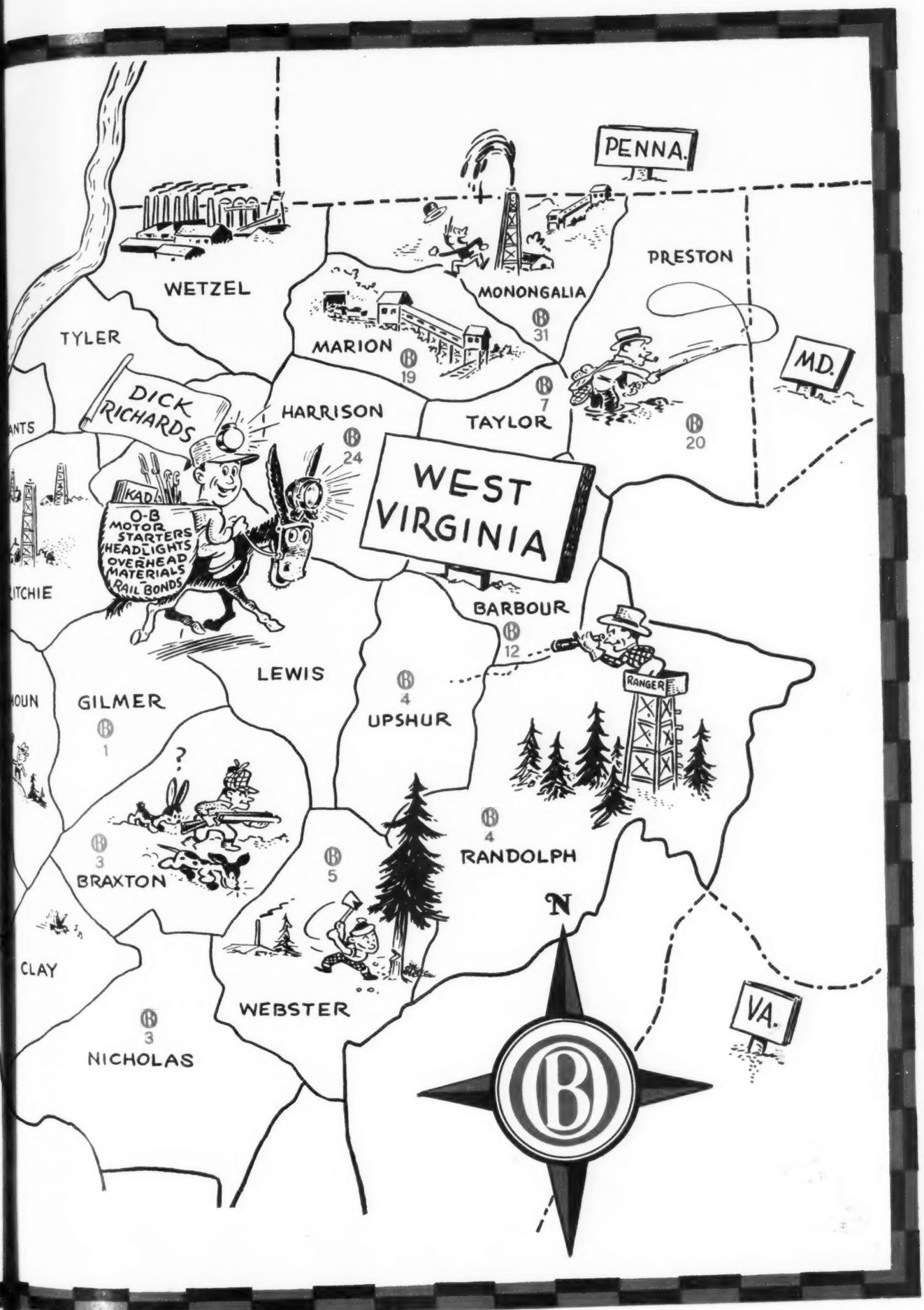
MANSFIELD, OHIO • U·S·A

Canadian Ohio Brass Company, Ltd., Niagara Falls, Ont., Canada

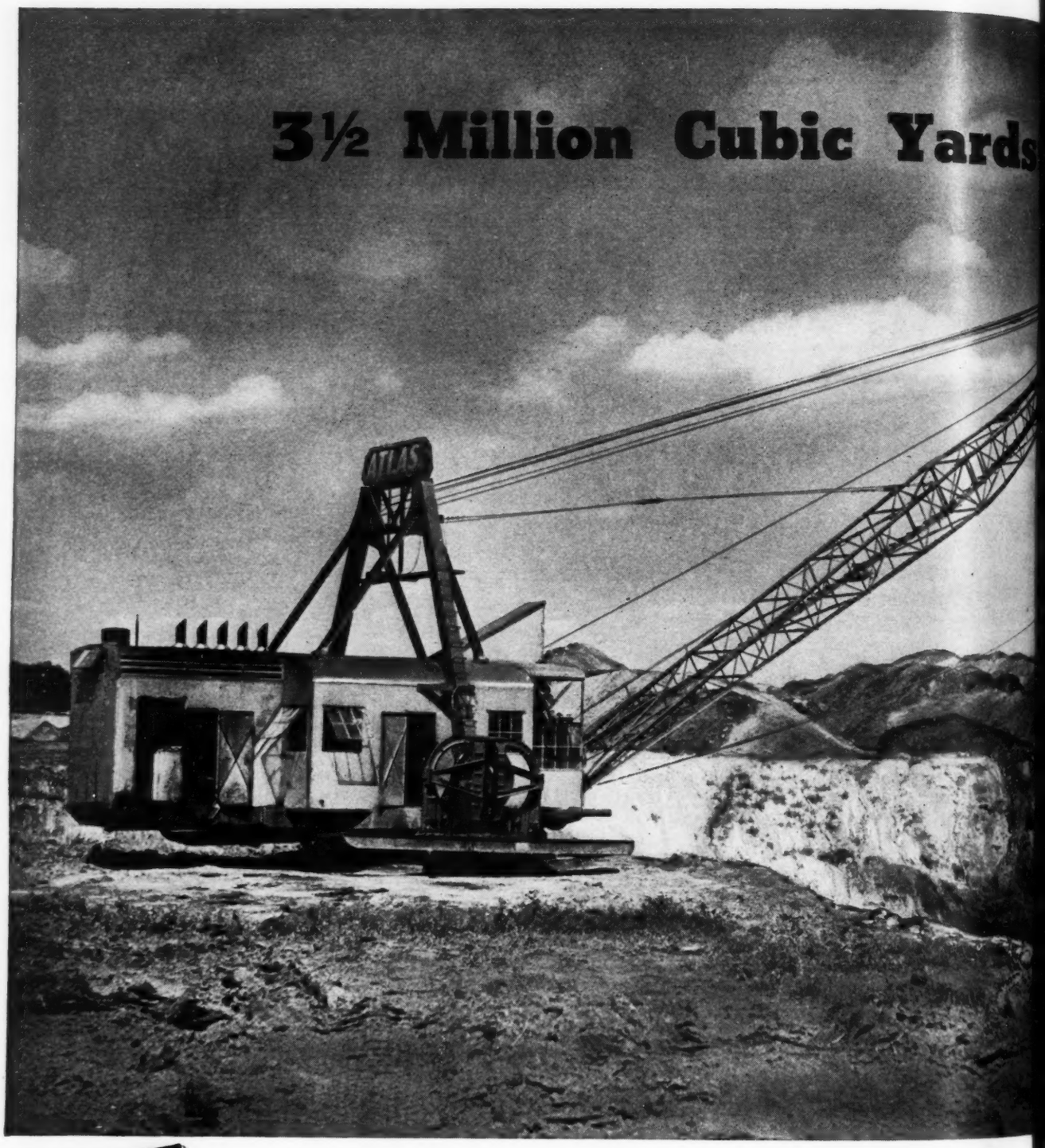


LEGEND

(B) Indicates the number of O-B-served properties in each of the larger coal-producing counties in northern West Virginia.


PENNA.
WETZEL
MONONGALIA
PRESTON
TYLER
MARION
MD.
DICK RICHARDS
HARRISON
TAYLOR
WEST VIRGINIA
KAD
O-B MOTOR STARTERS HEADLIGHTS OVERHEAD MATERIALS RAIL BONDS
BARBOUR
RANGER
LEWIS
GILMER
UPSHUR
RANDOLPH
BRAXTON
CLAY
WEBSTER
NICHOLAS
VA.
N

3½ Million Cubic Yards



TEXACO'S famous Crater Compound booklet, 32 pages of practical information on the lubrication of gears and wire rope. Yours for the asking. Write for a copy.

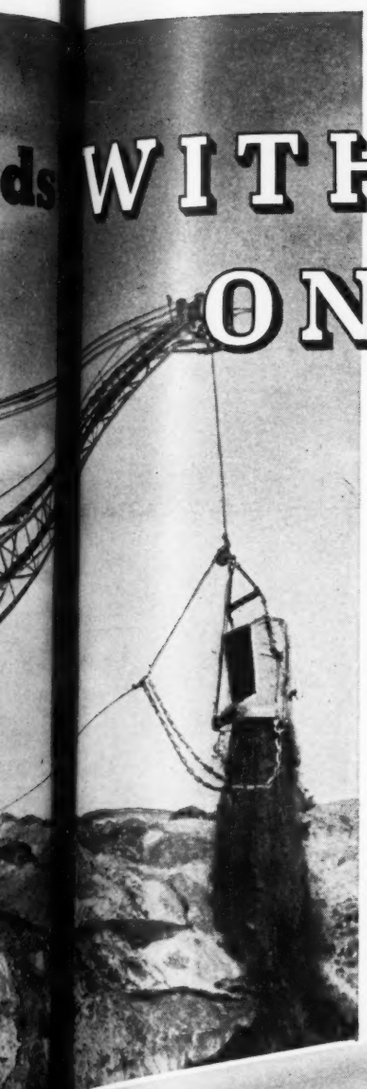
THIS BUCYRUS-ERIE, Monighan Dragline (4 yd. bucket, 110 ft. boom) is lubricated with the following Texaco Products: Texaco Ursa Oil for the F-M Diesel Engine, Texaco Crater Compound, Texaco Marfak.

TEXACO
REG. T.M.

Texaco Dealers invite you to tune in The Texaco Star Theatre—a full hour of all-star entertainment—Every Wednesday Night—Columbia Network—9:00 E.S.T., 8:00 C.S.T., 7:00 M.S.T., 6:00 P.S.T.

TEXACO

WITHOUT ONE SHUT-DOWN



OPERATING their Bucyrus-Erie, Monighan Dragline an average of 18 hours a day for 3½ years, the Atlas Coal Co., Oskaloosa, Iowa, never has had to stop once because of a breakdown, and is still going strong.

Texaco Crater Compound is used on the gears and crawling mechanism of the dragline, and of the loading shovels. It is also used in the tipple.

Texaco Crater Compound is viscous, adhesive and cohesive. It clings to metal surfaces, resisting rain water, abrasion, climatic heat and cold.

Experienced lubrication engineers trained in the selection and application of Texaco Coal Mine Lubricants will be glad to demonstrate that savings can be made with Texaco Perfected Lubrication.

For prompt engineering service and deliveries, phone the nearest of our 2279 warehouses in the United States, or write:

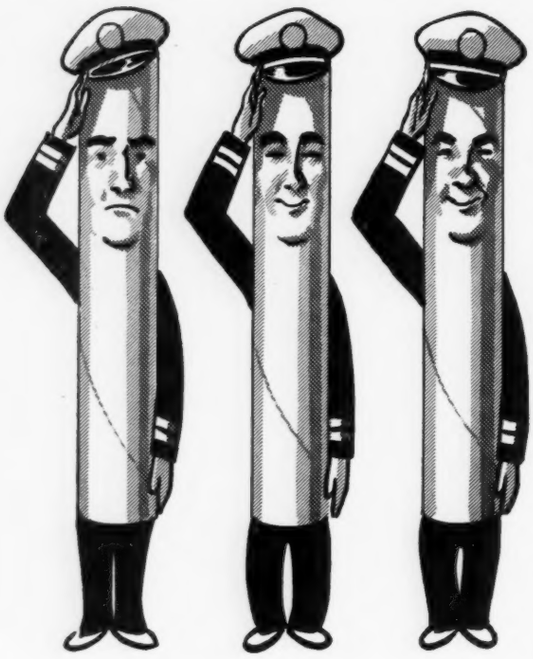
The Texas Company, 135 E. 42nd Street, New York, N. Y.

THIS TIPPLE is lubricated with Texaco Crater Compound, Texaco Marfak, Texaco Cup Greases.

•

Left. **ALL SHOVELS,** tractors and trucks are lubricated with Texaco Products exclusively. NOTE—Atlas Coal Company, after removing the coal, levels off the land and sets out shrubs and fruit trees.

Crater Compound



These Three ATLAS PERMISSIBLES

do a uniformly good job . . . on widely-varying types of coal

. . . ATLAS COALITE E

VELOCITY: 6000 FT. PER SEC.

Dense, very slow acting, high cartridge strength, permissible type explosive. Larger diameters used with considerable success in the thicker seams of coal. Develops a minimum amount of shattering action.

Minimum 8″ ctgs. per 50-lb. case

1¼″	1½″	1¾″	2″
133	96	72	53

. . . ATLAS COALITE M

VELOCITY: 8000 FT. PER SEC.

A "permissible" of medium density, velocity, and cartridge strength. Shears exceptionally well leaving clean ribs and back. One of the most popular Atlas Coalites for the thinner seams of coal.

Minimum 8″ ctgs. per 50-lb. case

1¼″	1½″	1¾″	2″
180	123	92	70

. . . ATLAS COALITE 0

VELOCITY: 6000 FT. PER SEC.

The highest cartridge count "permissible" that Atlas manufactures. Slow acting, low cartridge strength. Used in fragile, thin seams of coal that are easily broken down.

Minimum 8″ ctgs. per 50-lb. case

1¼″	1½″	1¾″	2″
244	166	113	93

HAVING approximately the same velocity, but ranging from dense to very bulky . . . these three Atlas Coalites are but examples of the wide range of properties available with Atlas Permissible Explosives. The Atlas representative will be glad to consult with you to determine which of Atlas' 19 "permissibles" can best produce the type of coal you want at lowest cost.

Coalite—Reg. U. S. Pat. Off.

ATLAS POWDER COMPANY, WILMINGTON, DEL.

Cable Address—Atpowco

Everything for Blasting

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Wilkes-Barre, Pa.

ATLAS

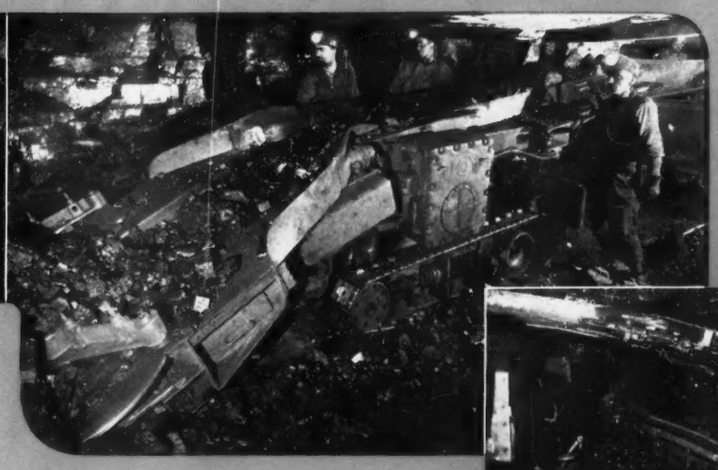
EXPLOSIVES

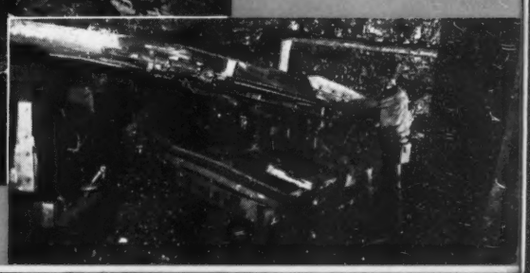
CHEMICALS ATLAS EXPLOSIVES

Joy 11 BU Loading Shuttle Car at Hutchinson Coal Co.

140 Joy Loaders

produce Northern West Virginia's Low Cost Coal



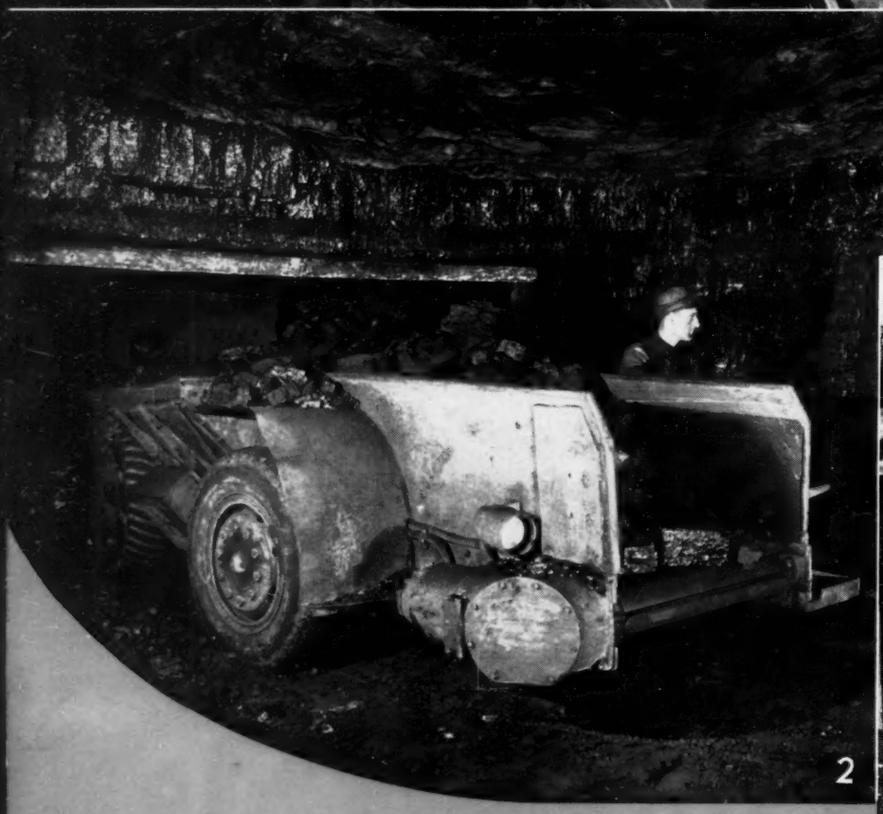


Above — Joy 7 BU at Jones Collieries.

Center — Joy 11 BU at Kelleys Creek Colliery Company.

Right — Joy 7 BU loading into car at Jones Collieries.

Joy



1. Joy 11 BU loading Shuttle Car at Consolidation.
2. Joy Shuttle Car hauling average 5 ton load enroute to discharge station at Hutchinson.
3. View of Joy Shuttle Car being loaded under timbers at Hutchinson Coal Co.

...sets the pace for production of low cost coal in West Virginia

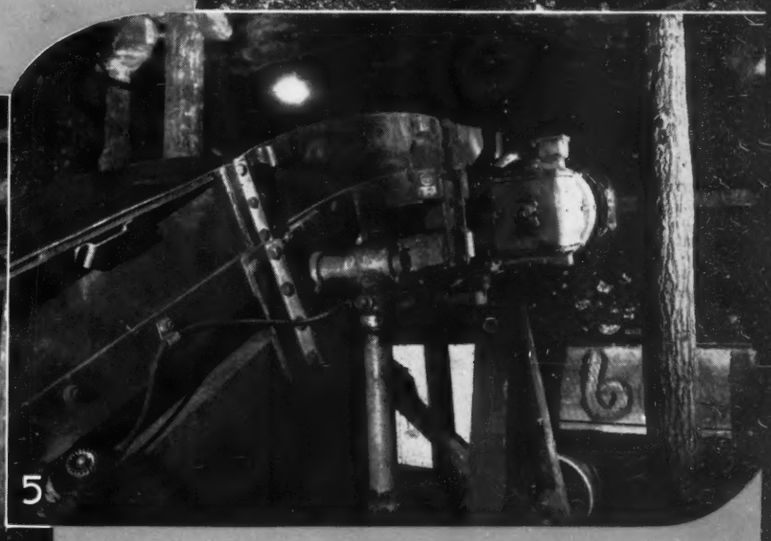
Joy Loaders and Shuttle Cars

are showing additional cost reductions in secondary haulage for

Northern West Virginia Mines

JOY MANUFACTURING CO.
FRANKLIN ··· PENNSYLVANIA

6



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4. Joy Shuttle Car discharging into elevating conveyor at Hutchinson.
5. Joy Elevating Conveyor emptying cars on main haulage at Hutchinson.
6. Loading 42" Joy Shuttle Car at Consolidation No. 25.

1. Joy 10 BU Loader working under timbers at Christopher Mining Co.
2. Joy 7 BU loading into mine car at Continental Coal Company, Sewickley Seam.
3. Joy 10 BU loading at Eagle Mine of Reppert Coal Company.
4. Joy 11 BU at Koppers Federal No. 3 Mine.

Consult a JOY Engineer for specific information on the most suitable unit for your mine

1

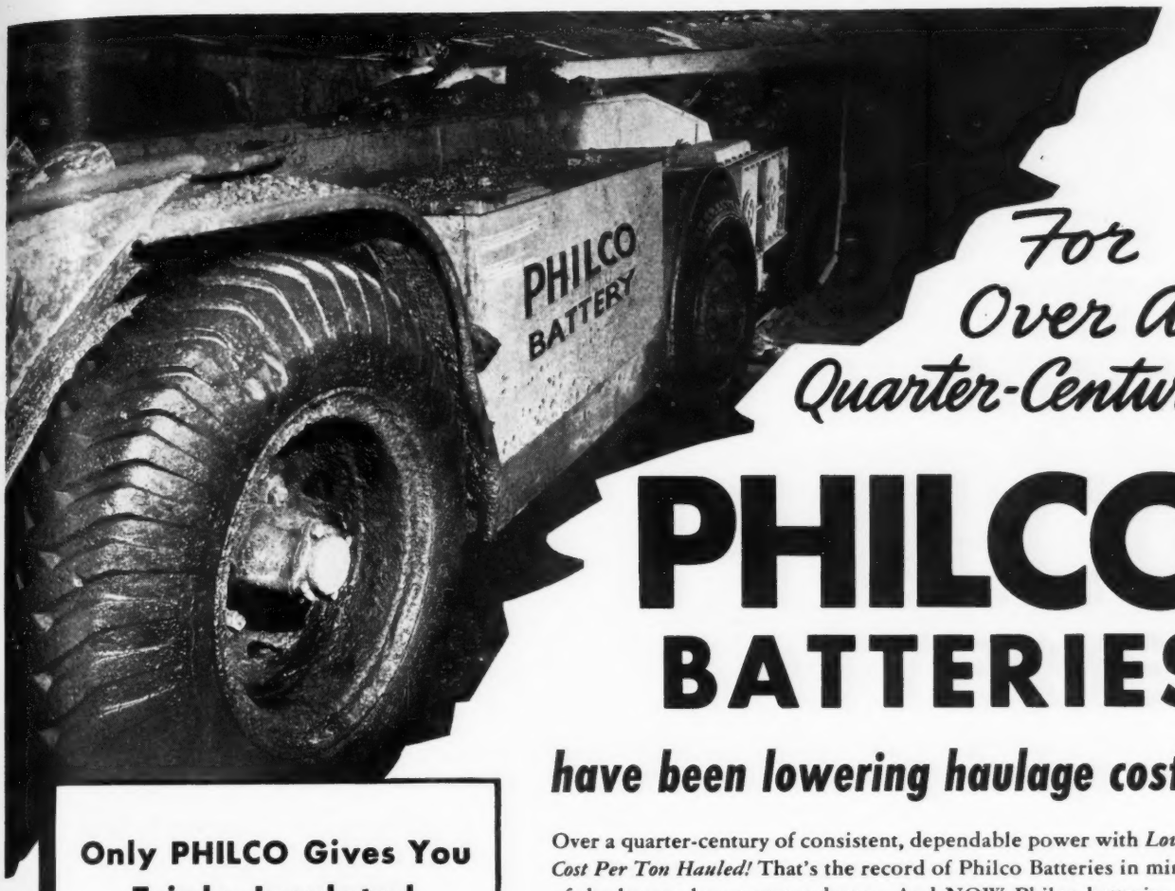
2

3

4

Joy Manufacturing Company

Franklin, Pa.



For Over a Quarter-Century

PHILCO BATTERIES

have been lowering haulage costs

Over a quarter-century of consistent, dependable power with *Lower Cost Per Ton Hauled!* That's the record of Philco Batteries in mines of the larger, low-cost producers. And NOW Philco batteries, in modern Shuttle Car operation, are again doing their part to lower haulage costs in these same mines.

Philco's specialization in coal mine haulage problems has produced batteries with *extra* capacity to keep pace with *every* mechanized mining program. There's a Philco to meet every condition efficiently and economically! Let one of our engineers work with you on your own battery haulage problems. Write—

PHILCO, Battery Division
Dept. 311, Philadelphia, Pa.

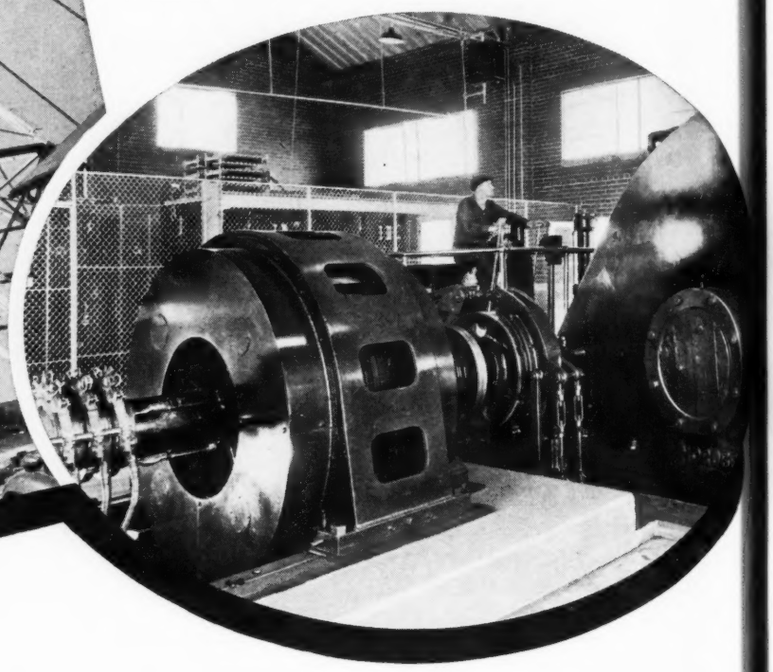
Only PHILCO Gives You Triple-Insulated Batteries with

K-PROCESSED PLATES

- **CLEAN UP** of *every* working place each day.
- **CONSTANT SPEED** of Shuttle Car through the shift.
- **EXTRA CAPACITY . . .** up to 10% more in the same compartment space.
- **TRIPLE INSULATION** insures retention of the active material in the plates of the batteries.
- **K-PROCESS** produces a plate, flint-hard throughout, yet porous for easy absorption of acid.
- **LONG, *USEFUL LIFE,*** with lower charging and maintenance cost assures low-cost service.

10-MILE REFUSE HAUL

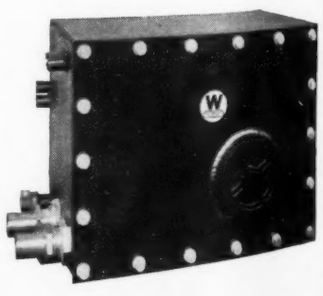
In addition to lowering maintenance costs and releasing many cars for coal production, power costs for refuse cars were slashed two-thirds by substituting a 512-foot vertical haul for a 10-mile underground trip. One car a minute is handled by the Nordberg straight drum hoist, driven by Westinghouse 600 hp CW stator shift induction motor with full magnetic control.



MODERNIZE WITH WESTINGHOUSE MOTORS

MAINTENANCE AND REPAIR COSTS kept down with Westinghouse explosion-proof or permissible type d-c motors for gaseous mines. Brushes and commutator completely protected, yet easily inspected through removable cover. Free passage of ventilating air.

EXPLOSION TESTED ENCLOSURE protects this permissible d-c magnetic starter for use with permissible-type constant or adjustable speed d-c motors. Remote or built-in push button operation. Definite time limit acceleration with dynamic braking.



PERMISSIBLE MOTORS AND TIMESTARTERS

Westinghouse

W WESTINGHOUSE ELECTRIC

CUT TO 512 FEET

COAL COMPANY'S NEW PLAN CUTS DISTANCE 99%, SLASHES POWER COSTS, AND REDUCES WEAR AND MAINTENANCE ON CARS.

A 10-mile underground haul of 250 to 300 cars of refuse per day proved too expensive for this Pennsylvania mine. Loading and making the trip tied cars up a full day. Maintenance costs were sky-high. And power charges were enormous.

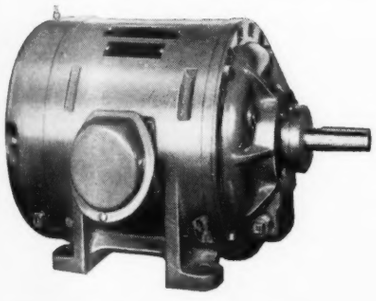
So . . . they sunk a new shaft 512 feet, and provided acreage immediately adjacent, for twenty-five years dumping. Now cars make four trips a day . . . releasing many for coal production. Maintenance costs dropped, and a recent test showed that power charges amount to only 4½ cents per car-trip.

This striking example is typical of the savings that modern methods can effect. If you want to look for similar opportunities, Westinghouse engineers will work with you. Call our local office, industrial agent or supply house.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

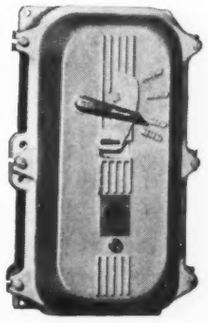
J-90271

AND CONTROL



KEEP OUT DUST AND DIRT, with Westinghouse totally enclosed fan-cooled motors, that stand up year after year. All vital parts enclosed. Self-cleaning ball bearings, overflow sump to prevent overgreasing and other features for long time, low cost operation.

SAVE IN FIRST COST and get all needed motor control and circuit protection in one compact, dust-tight and watertight, cast-iron enclosure. Westinghouse Combination Linestarters save time and money in wiring, conduit, labor and maintenance.



TOTALLY ENCLOSED MOTORS AND DUST-TIGHT CONTROLS

Motors and Control

CONTINENTAL HOISTS
SPOT CARS SPEEDILY

• BUILT BY
INDUSTRIAL DIVISION—
CONTINENTAL GIN CO.

There isn't a thing you need in a smooth-performing bearing that the four SKF Ball Bearings on this Mine Car Spotting Hoist haven't got.

They have *self-aligning characteristics* to compensate for shaft deflections, distortions or weave without cramping. They have *endurance* with which to carry heavy radial and thrust loads year after year without failure. They have all the other advantages that insure steady going at the lowest operating costs.

Get started *today* on real bearing savings by seeing your nearest SKF representative. He has more than 3000 bearing types and sizes from which to select the *right* bearings for your crushers, screens, skip-hoists, car wheels, loaders, cutters, drives, etc. 4435

SKF INDUSTRIES, INC., FRONT ST. & ERIE AVE., PHILA.

THE BEARINGS ARE
SKF

BALL & ROLLER BEARINGS

300 FEET OF TRU-LAY PREFORMED

sells 20,000 more! . . .

● A contractor once bought a big supply of non-preformed wire rope because of the then rising market. In spite of this the foreman dogged the heels of the superintendent, insisting that he be given TRU-LAY Preformed. Finally, the "sup" ordered a 300-foot length of TRU-LAY "just to keep that foreman quiet."

That was all TRU-LAY Preformed needed. Merely a chance to do its stuff. It did. So well, indeed, that reel after reel has since been ordered and used in spite of the large stock of non-preformed on hand.

TRU-LAY Preformed invariably gives this sort of service. Being preformed, TRU-LAY is a limber, flexible rope which handles easier, resists kinking, and doesn't fly apart when cut or broken. Being preformed, TRU-LAY spools on the drum better, and resists the usual tendency to rotate in sheave grooves. It has such amazing resistance to bending fatigue that of course it lasts longer.

Order a length of TRU-LAY Preformed for your job. You will find it gives greater value. All American Cable ropes made of Improved Plow Steel are identified by the Emerald Strand.

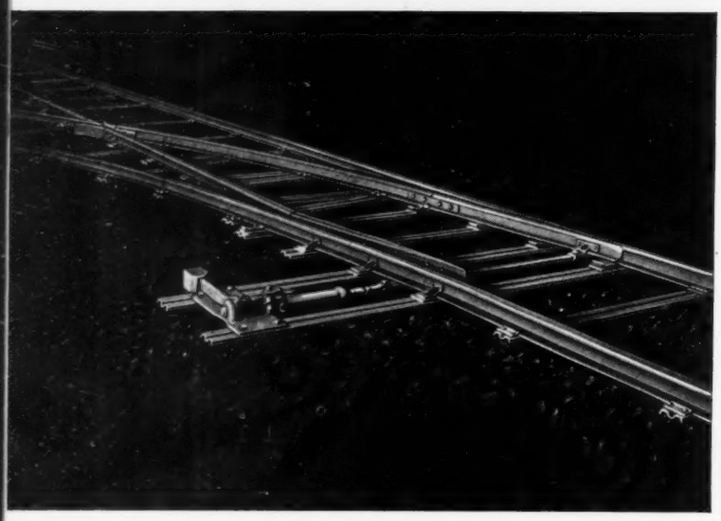
BUY ACCO QUALITY *whether it is American Cable Division's Wire Ropes and Slings—American Chains (Weed Tire Chains, Welded or Weldless Chains)—Campbell Abrasive Cutting Machines—Page Wire Fence—Page Welding Wire—Page Traffic Tape—Reading-Pratt & Cady Valves—Wright Hoists—or any other of the 137 ACCO Products.*

AMERICAN CABLE DIVISION
WILKES-BARRE, PENNSYLVANIA
District Offices: Atlanta, Chicago, Detroit, Denver, Los Angeles, New York, Philadelphia, Pittsburgh, Houston, San Francisco

AMERICAN CHAIN & CABLE COMPANY, Inc.

AMERICAN CHAIN DIVISION • AMERICAN CABLE DIVISION • ANDREW C. CAMPBELL DIVISION • FORD CHAIN BLOCK DIVISION • HAZARD WIRE ROPE DIVISION • HIGHLAND IRON AND STEEL DIVISION • MANLEY MANUFACTURING DIVISION • OWEN SILENT SPRING COMPANY, INC. • PAGE STEEL AND WIRE DIVISION • READING-PRATT & CADY DIVISION • READING STEEL CASTING DIVISION • WRIGHT MANUFACTURING DIVISION • IN CANADA: DOMINION CHAIN COMPANY, LTD. • IN ENGLAND: BRITISH WIRE PRODUCTS, LTD. • THE PARSONS CHAIN COMPANY, LTD. • *In Business for Your Safety*

TOWARD BETTER, LOWER

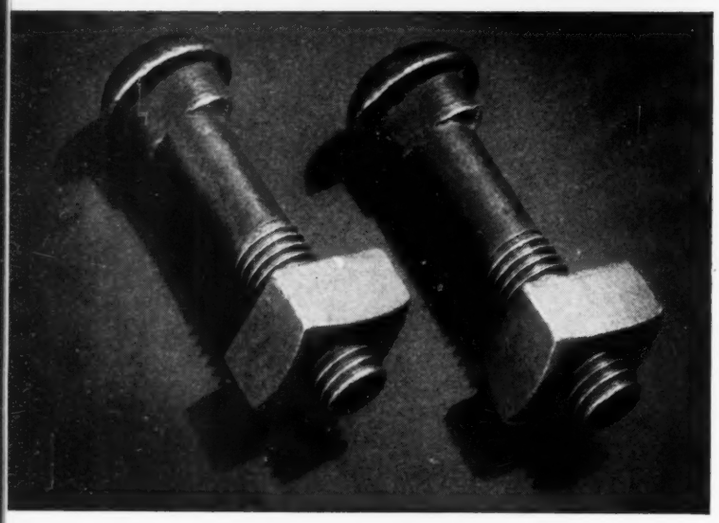


Steel switch ties save time

Bethlehem has developed a set of steel switch ties which are finding wide use in room turnouts laid on standard wood ties as well as in those laid on standard steel ties.

The set consists of two, three, or four No. 4 steel ties, depending on the length of switch points. Each tie has a switch plate welded to the tie, a rail brace welded to the switch plate, and revolving clips which lock the stock rails in place. Where switch stands are to be used, the No. 1 and No. 2 ties are extended and drilled to accommodate a 1201 or 1217 switch stand on either the right or left side of a right-hand or left-hand turnout.

Users have found that these switch ties save from one to three hours in the time required to install a turnout. They can be made for any weight of rail, any gage of track, and any angle of turnout.



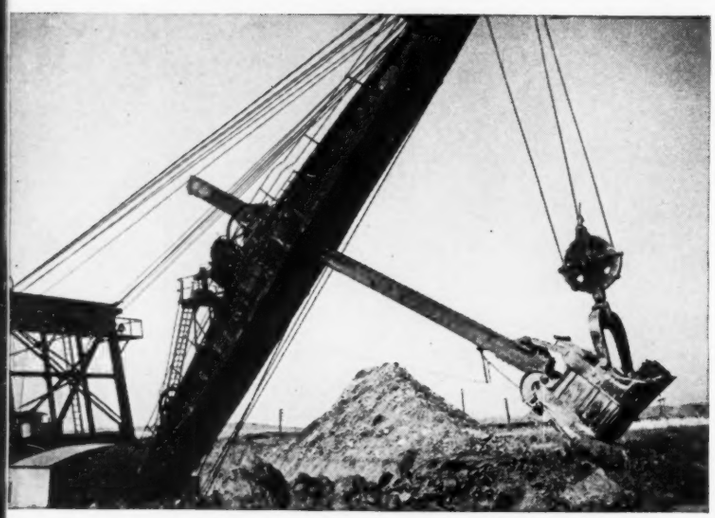
What are "rolled-thread" track bolts?

Occasionally customers ask us what is meant by "rolled-thread" and "cut-thread" track bolts.

In making a cut-thread bolt, threads are cut from a full diameter shank, removing a certain amount of the metal. In making a rolled-thread bolt, the shank is of slightly less diameter than the nominal bolt size. Threads are rolled onto this shank; metal from the thread root is displaced to form the thread crest; no metal is actually removed.

There is no difference in the form of the threads of the two types of bolts; cutting dies and rolling dies are made to the same degree of accuracy. Test prove that any difference in strength is in favor of the rolled-thread bolt.

Rolled-thread bolts are available in most small popular sizes. There should be no objection to accepting these, when available, in place of the slightly heavier cut-thread bolts.



Mayari R—a diet for dipper sticks

If you can reduce the weight of dipper sticks and buckets with no loss of strength, you can increase the capacity of stripping shovels by substantial amounts. So figured one large coal operator, who now uses Mayari R for his sticks and buckets.

If you can increase the strength of dipper sticks and the life of buckets, with no increase in weight or loss of capacity, you can decrease maintenance of stripping shovels. So figured another operator, who used to be bothered by excessive repair costs, but now uses Mayari R.

Mayari R—a high-strength corrosion-resisting steel—is an excellent material for applications where dead weight costs money. It will enable you to cut weight without increasing maintenance costs or to cut maintenance without increasing dead weight.

Bethlehem Products for the Mining Industry: Rails . . . Steel Ties . . . Frogs, Switches, Switch Stands, Turnouts and Special Trackwork . . . Track Bolts, Nuts, Spikes . . . Mine Cars . . . Wheels, Axles . . . Bars, Plates, Structural Shapes . . . Steel Construction . . . Steel Timbering . . . Pipe, Boiler Tubes . . . Galvanized Roofing, Siding . . . Wire, Nails, Fence . . . Wire Rope, Strand . . . Drill Steel . . . Forgings . . . Castings . . . Pig Iron.

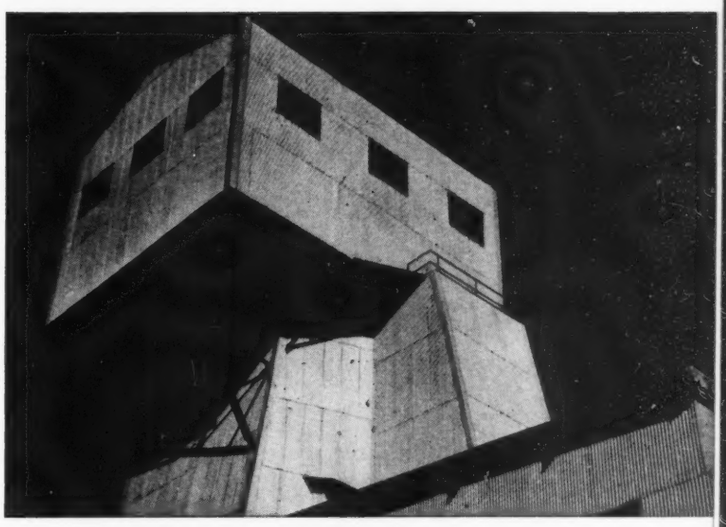
BETHLEHEM STEEL

MAINTENANCE FOR MINES

Beth-Cu-Loy, a rust-resisting steel roofing

Life of corrugated steel roofing and siding can be lengthened, considerably, by the use of rust-resisting steel. This is particularly true around coal mines, where fumes and smoke from burning red dog make atmospheric corrosion severe.

Such rust-resisting steel is not expensive. Beth-Cu-Loy galvanized roofing and siding sheets cost only 3 to 5 per cent more. When labor of installation is taken into consideration, the overall increase in investment may be as little as 2 per cent. Yet Beth-Cu-Loy has double the resistance to rusting, compared to ordinary steel—gives you two roofs or sidings for one.

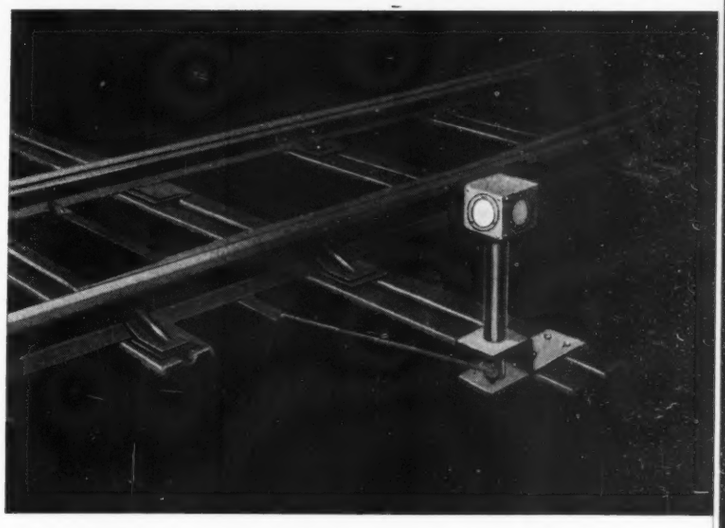


Protection at switches

Here is a practical target stand for use in mines. It is simple, sure, and inexpensive.

The Bethlehem Mine Target Stand is purely mechanical—has no trick parts and requires no wiring. Red or green indications are secured by the use of high-grade reflector buttons. The stand operates from the switch rod rather than from the switch stand, hence gives a true indication of point conditions even where spring connecting rods are used.

Light from a miner's lamp is enough to throw back a reflection 200 ft. or more. The target gives indications in both directions from the switch. It can be mounted on steel ties or on wood, and either to the right or to the left of any switch.



Form-Set ropes are safer to handle

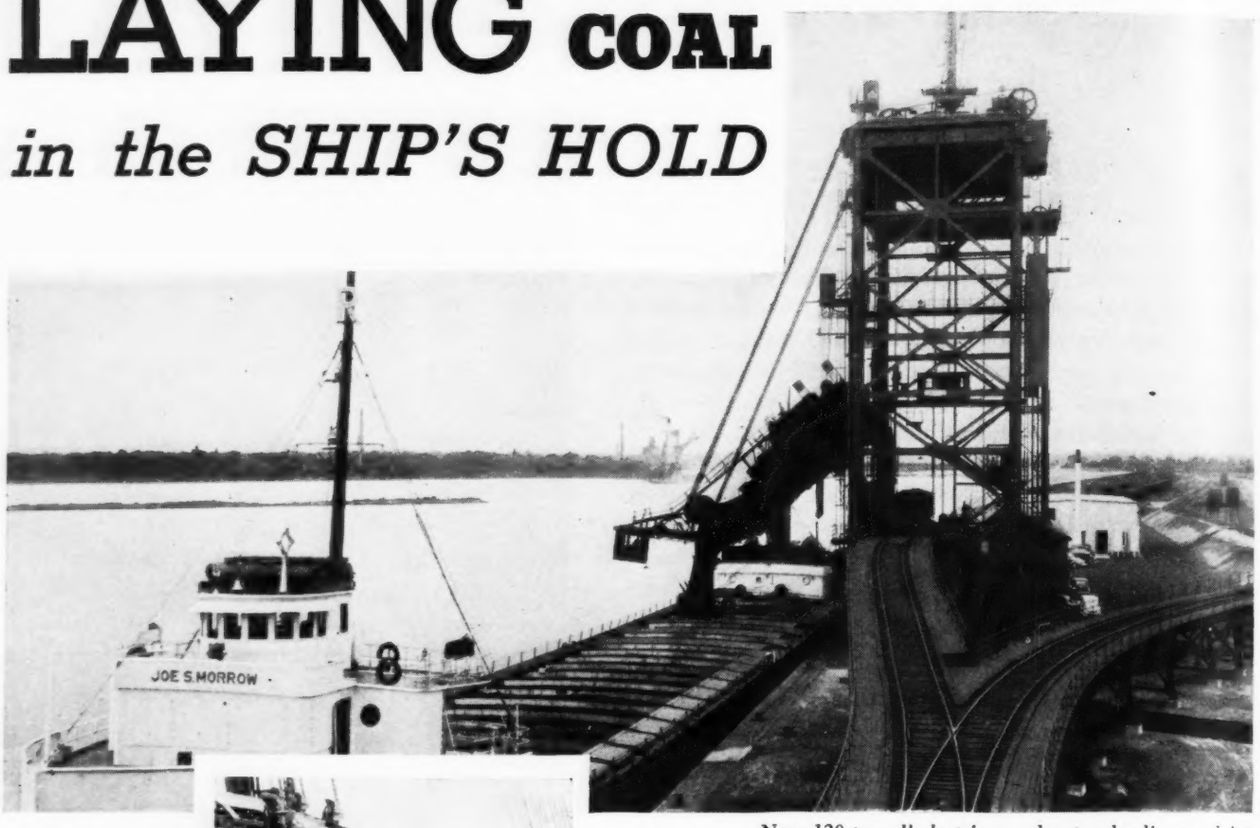
Wherever wire rope must be handled frequently, as in cutting-machine feed ropes, it should be of pre-formed construction. Hand injuries, resulting from porcupined wires, will be lessened. Men will use the rope longer. And the rope will actually wear better.

Form-Set (pre-formed) rope differs from ordinary rope in that individual strands and wires are shaped to fit the rope. Instead of being held in place by tension, they lie in place naturally. When the rope wears to the point where outside wires begin to break, these wires, rather than sticking out, tend to lie in place.

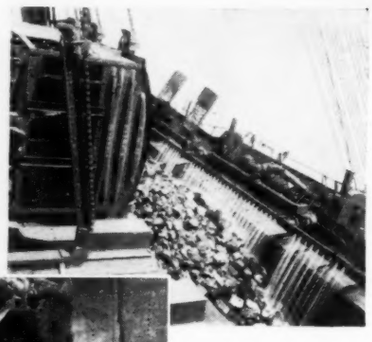
Wires in a Form-Set rope are "relaxed" when the rope is idle, come under stress only when the rope goes to work. Form-Set rope generally lasts longer, particularly where small sheaves are used.

BETHLEHEM STEEL COMPANY

LAYING COAL *in the SHIP'S HOLD*



New 120-ton all-electric car dumper loading coal into lake vessel at The Pennsylvania Railroad Docks, Sandusky, Ohio. Operated by Lower Lake Dock Company. Designed, fabricated and erected by Heyl & Patterson.



Coal is dumped into pan from which it smoothly flows into telescoping chute. The sprinkling system can be regulated over a wide range.

Combination gate and coal trimmer unit on telescoping chute passes large mass of coal into hold of vessel with minimum of degradation.

Loads Car a Minute without Degradation

This giant loading machine lifts the largest coal car, fully loaded, dumps the contents into the cargo-carrying vessel, returns the empty car to its track—all in one minute.

Although the casual observer cannot help being impressed with the speed and precision which mark the operations of this dumper, only those more directly interested in the production, transportation and use of clean, sized coal are likely to catch the refinements of engineering design which make possible the smooth, controlled flow of coal from car to ship's hold.

Only an organization with unusual experience and facilities could have aided in the solution of the problems incident to the construction of such specialized coal-transfer equipment. You have at your disposal the same experience and facilities. Whatever the link in the chain of coal operations from mine to point of distribution—a complete tipple, a preparation plant, boat loading and unloading, storage—you can depend upon Heyl & Patterson for sound planning and effective execution.

Let us know of your problem. Perhaps we can help you, as we have others, to find the low-cost, resultful answer.

COMPLETE TIPPLES, SCREENING AND CLEANING PLANTS
ROTARY DUMPS • CONVEYORS
CRUSHERS • CAR RETARDERS
WEIGH FEEDERS • HOISTS
INSPECTION TABLES
REFUSE DISPOSAL CARS
BOAT UNLOADING PLANTS

HEYL & PATTERSON INC.
50 WATER STREET PITTSBURGH, PA.

Super-WELD RAIL BONDS

ARE STANDARD AT MANY OF THE FOREMOST MINES

In Northern West Virginia

(names on request)

Cut-away view. Note penetration of copper strand into terminal.

THE EVERLAST Super-WELD RAIL BOND

REVERSIBLE RAIL BOND

has proven its superiority by an enviable record of actual service in the model mines of District 3. Where efficiency and economy are prime considerations in bonding practice . . . you'll find Super-Welds.

THE Super-WELD LINE:

Everlast

PM-4
PM-5
PM-6
PM-10
TP-9

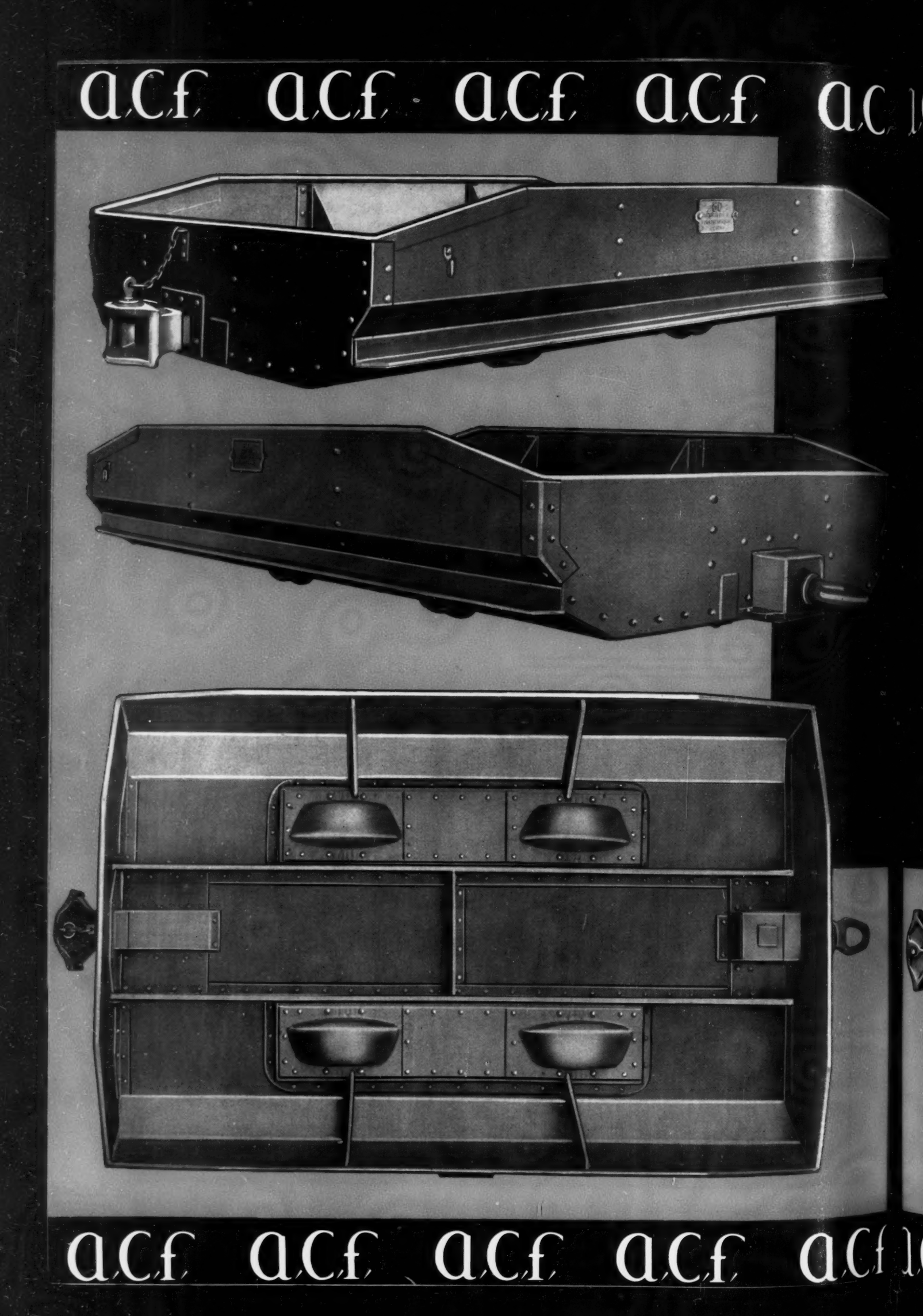
For Efficiency—Economy Standardize on Super-WELD

For eighteen years manufacturers of Quality Replacement Parts for Mining Machinery

PENN MACHINE COMPANY

JOHNSTOWN, PA.

Sales and Service Throughout the Coal Fields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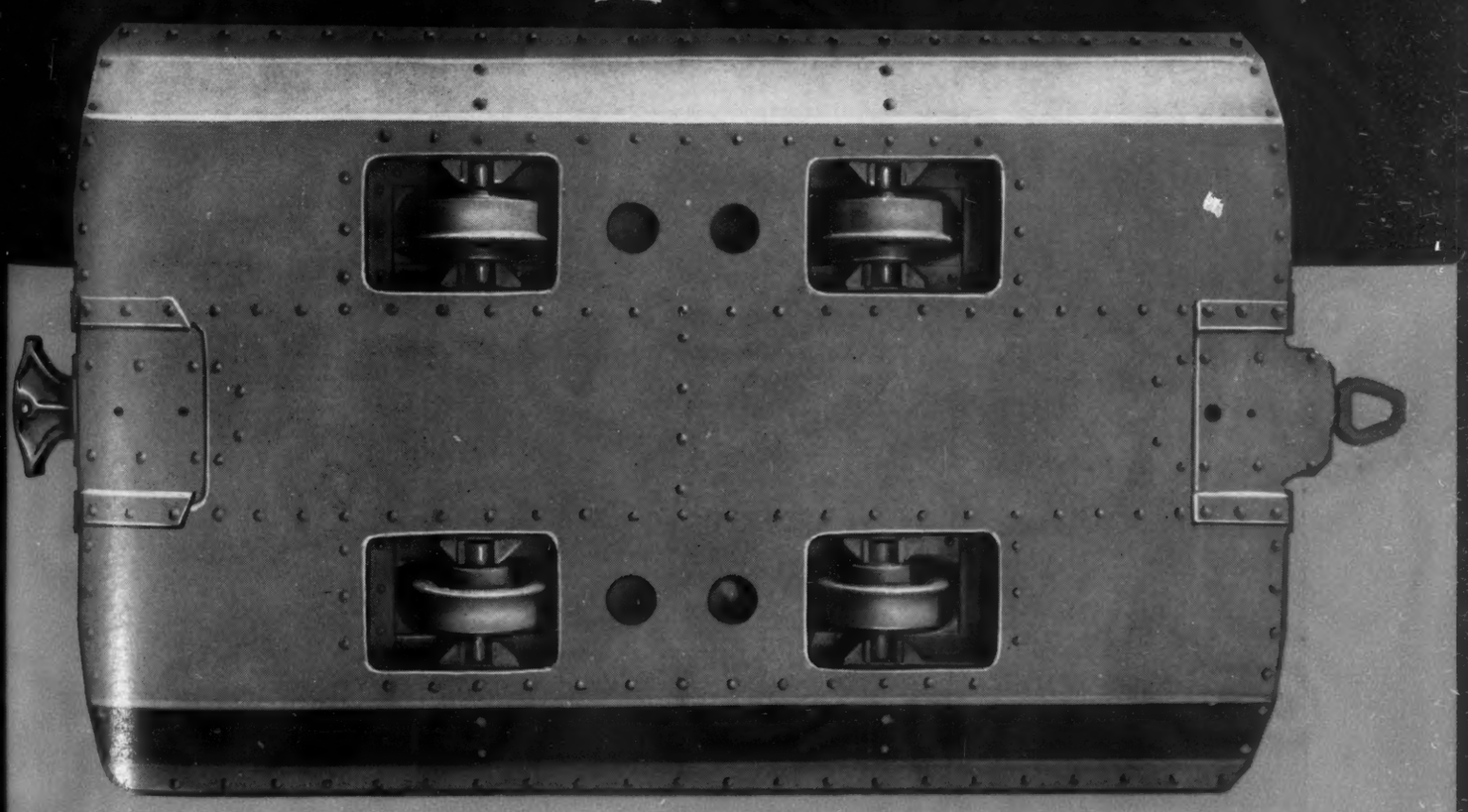
a.c.f. Cars always have the utmost value for your mine car dollar . . . The utmost in strength and durability . . . Everything needed to help reduce haulage costs. Hundreds of mining companies have profited by buying a.c.f. Quality Cars . . . If your old cars are too small to compete in the present market let us show you what can be done with new and larger cars. We will be pleased to furnish parts for your old cars . . . a.c.f. Mine Car Wheels are made by a special heat-treating process, of a special mixture of metals, will wear longer and operate with less friction on the rails because they are harder than steel and stronger than iron and are the best wheels made today for mining and transportation service.

AMERICAN CAR AND FOUNDRY COMPANY

New York • St. Louis • Chicago • Philadelphia • Berwick, Pa.
Pittsburgh • Cleveland • Huntington, W. Va.



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"Paving"— THE WAY TO MINING PROFIT WITH

WEST VIRGINIA

Dollar-Saving

TRACK EQUIPMENT

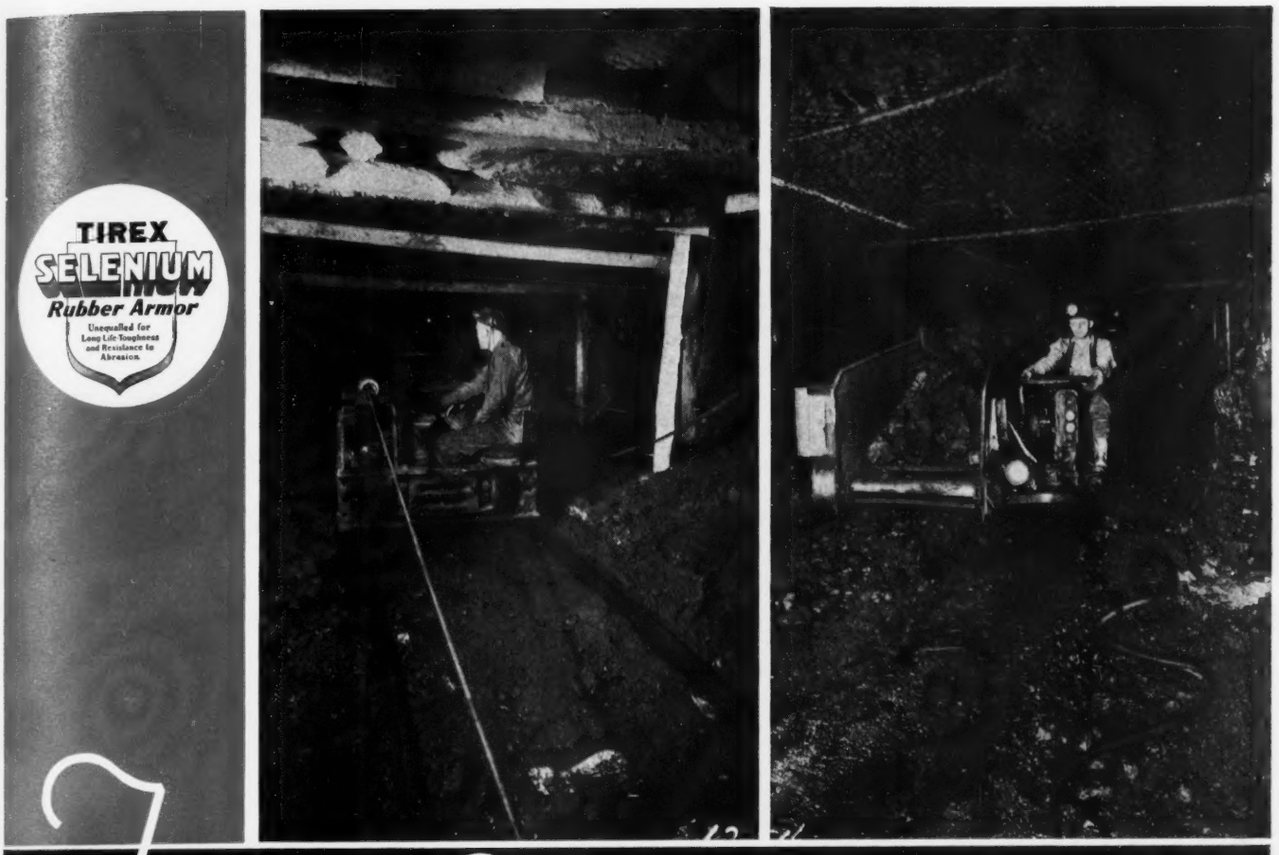
Wide use of West Virginia's steel ties and track equipment in the West Virginia area testifies to the industry's confidence in these dependable production products. Such companies as Continental, Arkwright, Dawson and Getty are leading operators who let West Virginia "pave" the way to bigger profits. May we quote on your requirements?

While these two "model mine" views show only turnouts and turnout ties, West Virginia supplies track work equipment for every need.

The West Virginia Rail Co.

HUNTINGTON WEST VIRGINIA

A COMPLETE LINE OF DOLLAR-SAVING TRACK EQUIPMENT



THE POWER LINE FOR *Low* Cost Production

Mechanized mining has gone ahead with giant strides in the last four years – Simplex-TIREX Cables have kept pace with every demand. Today, TIREX Cable is used on drilling, cutting and loading machinery and on cable-reel locomotives, in leading mechanized mines everywhere.

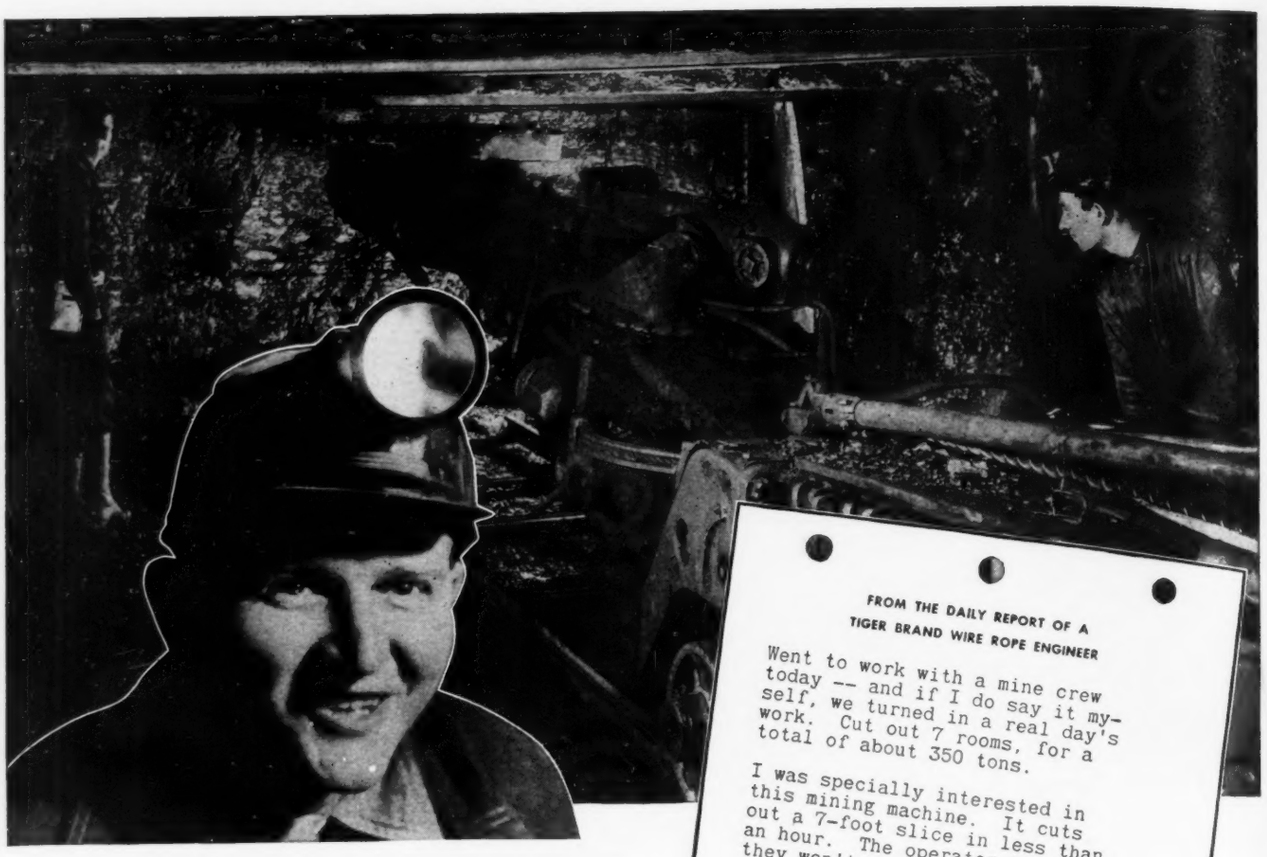
An outstanding feature of all TIREX cords and cables is the "selenium rubber armor." It is a 60% rubber sheath properly compounded and vulcanized with selenium to obtain maximum toughness. The selenium rubber armor is a distinguishing feature of all TIREX cables and it makes them unexcelled for resistance to abrasion.

The new markings which are put on stock sizes and types of Simplex-TIREX Cords and Cables, are molded on the rubber sheath – raised slightly above the surface so that there is no decrease in the thickness of the famous TIREX "selenium rubber armor." They not only identify the cord or cable as Simplex-TIREX but give complete identification including number of conductors, type and voltage rating. They are an added TIREX feature designed for your convenience and safety but cost you nothing extra.

Simplex Wire & Cable Company, 79 Sidney Street, Cambridge, Mass.

Simplex – TIREX

The only cable armored with Selenium Rubber



FROM THE DAILY REPORT OF A
TIGER BRAND WIRE ROPE ENGINEER

Went to work with a mine crew today -- and if I do say it myself, we turned in a real day's work. Cut out 7 rooms, for a total of about 350 tons.

I was specially interested in this mining machine. It cuts out a 7-foot slice in less than an hour. The operator tells me they won't use anything but Excellay Preformed Wire Rope on it. "I've tried 'em all," he says, "but I always come back to Excellay."

He puts Excellay down as the rope that lasts longer, does more work, and is safer to handle.

Yours,

Art

"I'VE TRIED 'EM ALL BUT I ALWAYS COME BACK TO EXCELLAY!"

ALWAYS on the job, checking performance, are the American Tiger Brand Wire Rope Engineers. These men spend most of their time right out in the field watching you and thousands of other operators put wire rope through the paces. That's how they know so well what kind of punishment it has to stand—and how to help you get the greatest possible performance out of every dollar you invest in wire rope. That is their most important job.

Be sure to take full advantage of the services these men offer. Often, because of their close contact with the field, they can give you valuable time- or money-saving tips on operation.

American Tiger Brand Wire Rope is made in all constructions and grades. Write us for complete information—and ask for one of our engineers to call and check over your wire rope.

EXCELLAY *Preformed* **WIRE ROPE**

AMERICAN STEEL & WIRE COMPANY
Cleveland, Chicago and New York
For Anthracite Service: Miners Bank Building, Wilkes-Barre, Pa.

COLUMBIA STEEL COMPANY
San Francisco

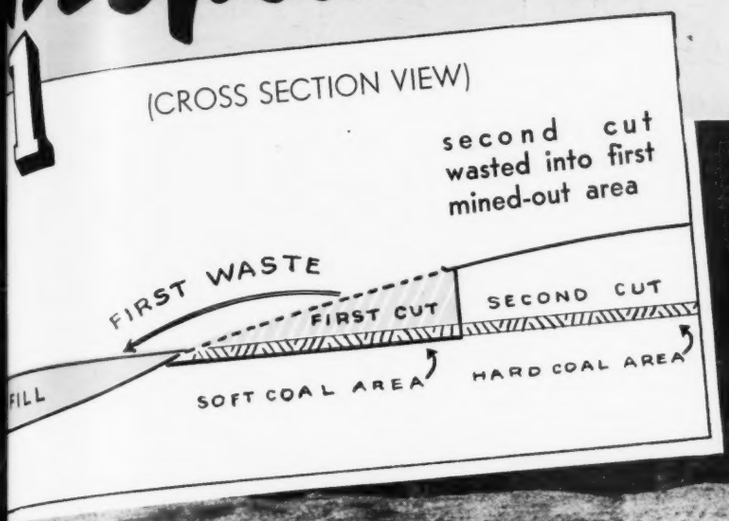
United States Steel Products Company, New York, *Export Distributors*

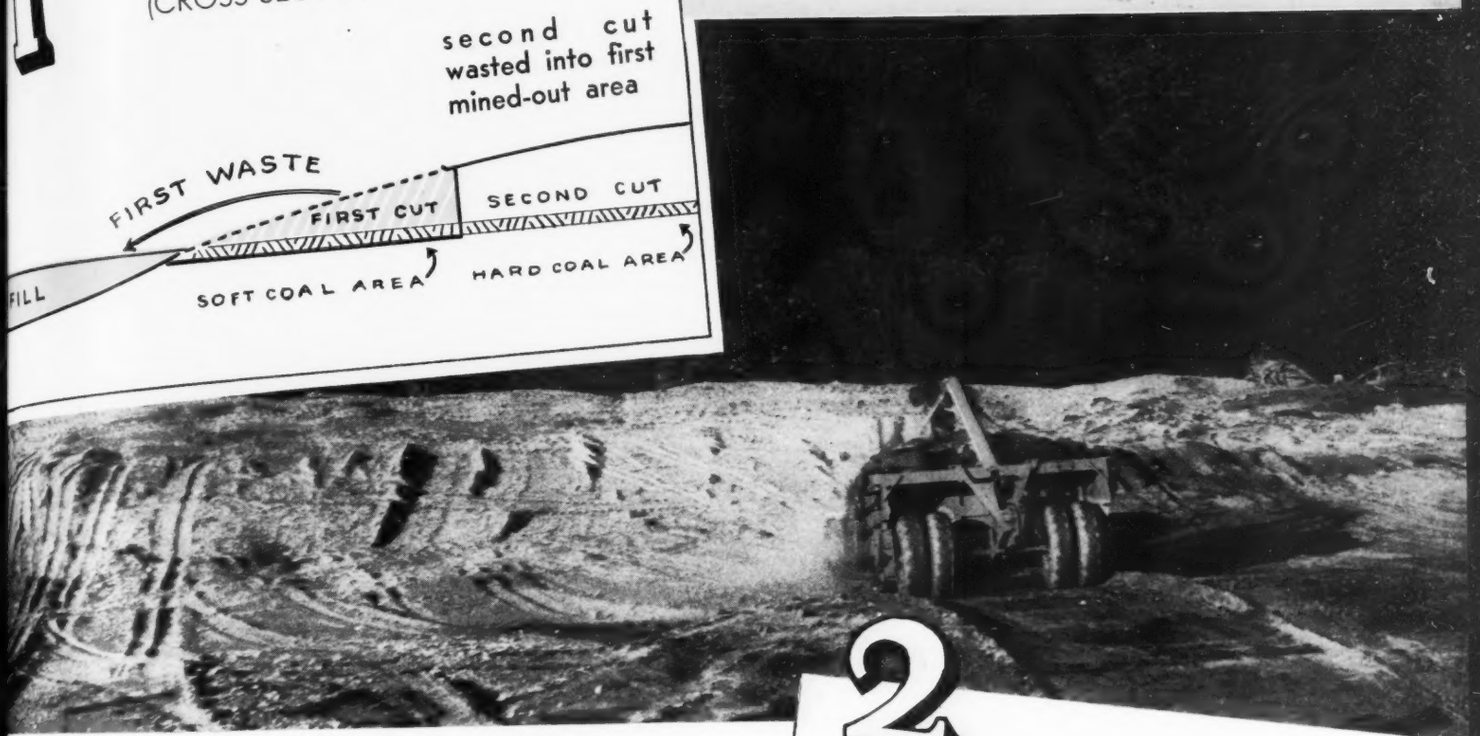
UNITED STATES STEEL

BRIGGS PITS ONE PROFIT AGAINST THE OTHER *with*

Preplanned Stripping

1





2

...TO ACCOMMODATE CURRENT MARKET DEMANDS...

With "two mines in one" on his Hopedale, Ohio, property, R. L. Briggs gives his customers what they want—hard or soft coal—*when they want it* . . . with the tools that offer the flexibility to alternate operations overnight. At the same time, by laying out Carryall* Scraper, Rooter* and 'Dozer stripping for continuous wasting into worked-out areas, he has eliminated rehandling expense. Take a look at performance:

One 12-yard LeTourneau Carryall—loading, hauling and dumping over 600-foot cycles—was clocked at 85 bank yards of clay stripped every 50-minute working hour. That's 1700 yards a 20-hour day for *one* unit . . . with a second Carryall delivered this fall, *doubling* production! . . . proving *conclusively* that the LeTourneau method offers this well-known operator savings surpassing all others.

. . . Nor does Briggs make "allowances" in shale. He's Rooting his way through first . . . for the industry's lowest-cost fragmentation . . . to keep production on schedule. Then, on his Rooter-equipped tractor, he's mounted an Angledozer for general pit clean-up . . . in addition to clearing new stripping areas of trees, brush and roots, thus eliminating costly hand clearing . . . *without adding a nickle for equipment "extras."*

What more could *you* ask? In this case, Briggs is getting a new truck road built direct from pit to the main highway—cutting hauling time and distance *two-thirds*—with these *same* tools. In *your* case you'll find there's no end to the savings LeTourneau stripping tools will effect on your property. Ask your LeTourneau and "Caterpillar" dealer to demonstrate *soon!*

LETOURNEAU

Stripping EQUIPMENT

CARRYALL* SCRAPERS,

ANGLEDOZERS*, BULLDOZERS, ROOTERS*, POWER CONTROL UNITS, DRAG SCRAPERS, PUSHDOZERS, SHEEP'S FOOT ROLLERS, CRANES, TREEDOZERS. *Name Reg. U. S. Pat. Off.

SYMONS SCREENS

meet today's requirements for better screened coal

• • • • •

Used by many of the mechanized mines of Northern West Virginia

Getty Coal Company
Hepzibah, W. Va.
4' x 14' Single Deck

Dawson Coal Company
Dawson Mine, W. Va.
4' x 16' Single Deck

In the rapidly expanding stoker coal market, also for making other sizes where fine screening is done, extreme accuracy of sizing has become a recognized essential. Symons Screens, because of their efficient screening action, are especially adapted for fine sizing. This is evidenced by the 168 installations which have been made in coal alone in the few years since their introduction.

Coal prepared with Symons Screens has a more ready sale, brings a premium price and increases profits. The screening surface on the Symons is set level and has an action that permits of extreme accuracy of sizing and great capacity. In a level screen, coal does not cascade and degradation is reduced to a minimum. For better prepared coal, investigate the merits of Symons Screens.

NORDBERG MFG. CO. MILWAUKEE WISCONSIN

SYMONS SCREENS

TIMKEN BEARINGS CUT COSTS IN THE MECHANIZED MINES OF NORTHERN WEST VIRGINIA

Thousands of TIMKEN Tapered Roller Bearings are used in northern West Virginia coal mines—in mine cars, locomotives, loading machines, belt conveyors, shuttle cars, slope rollers and other equipment.

Following is a partial list of the mines and the kinds of Timken Bearing equipment used in them.

Bunker Mine, Davis Wilson Coal Co., mine cars, loading machines.

Continental Mine, Continental Coal Co., mine cars, slope rollers.

Emily Mine, Monongahela Rail & River Coal Corp., loading machines.

Dawson Mine, Dawson Coal Company, mine cars.

Federal No. 1 Mine, Koppers Coal Company, mine cars, belt conveyors.

Consolidation Coal Company Mine No. 25, shuttle cars.

Jamison Mines Nos. 8 & 9, Jamison Coal & Coke Co., mine cars, belt conveyors.

Laura Lee Mine, Hutchinson Coal Co., shuttle cars.

Maiden Mine, Kelley's Creek Collieries Co., mine cars, loading machines.

Rachel Mine, Jones Collieries, Inc., mine cars.

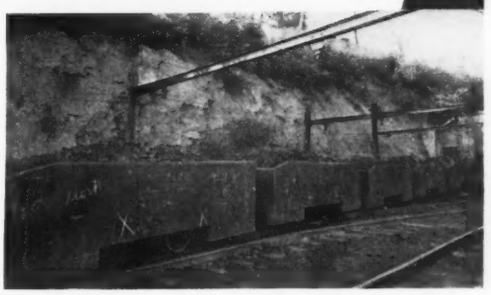
Louise Mine, Louise Coal Company, mine cars, loading machines.

Pursglove Mines Nos. 2 & 15, mine cars.

Robinson Run Mine No. 2, Christopher Mining Co., mine locomotives, belt conveyors.

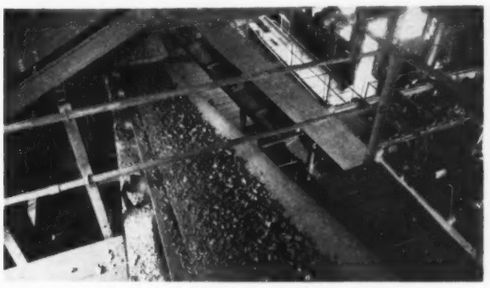
These operators, like hundreds of others, know that TIMKEN Bearings are important factors of efficient performance and low cost wherever they are installed.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO



Timken Bearing Equipped all steel mine cars at Maiden Mine, Kelley's Creek Collieries Co. All mine cars (374) used at this mine are equipped with TIMKEN Bearings.

Joy 11 BU loading machine loading coal directly into Joy Shuttle Car in Mine No. 25, Consolidation Coal Co. Both machines are Timken Bearing Equipped.



Robins Belt Conveyors equipped with TIMKEN Bearings at Mine No. 8, Jamison Coal & Coke Co.

Myers-Whaley Automat Loader equipped with TIMKEN Bearings in Emily Mine, Monongahela Rail & River Coal Corporation.

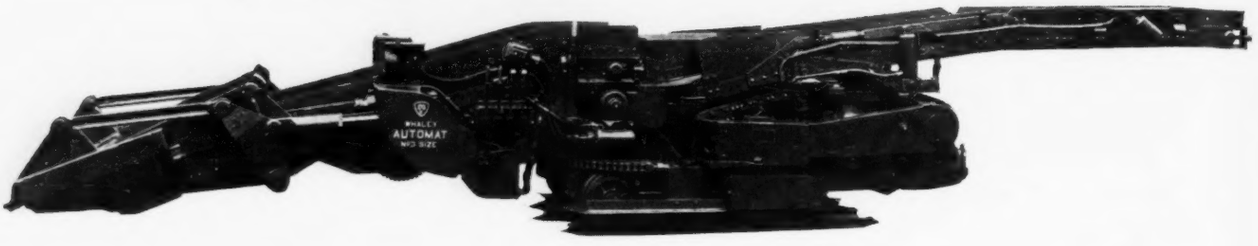
TIMKEN
TAPERED ROLLER BEARINGS

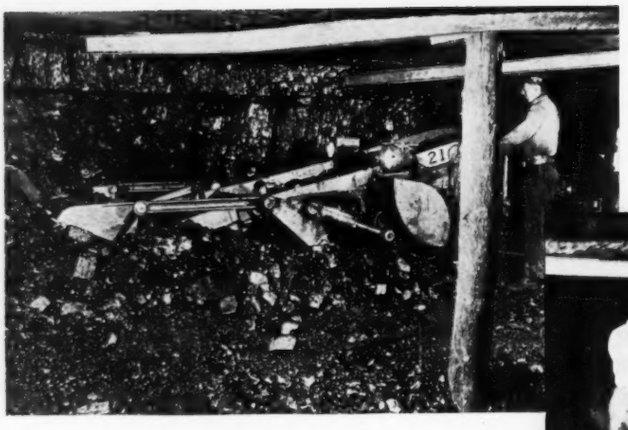
★ Loading Coal in the Pittsburgh Seam

with the **"WHALEY AUTOMAT"**

IN THE FAIRMONT DISTRICT

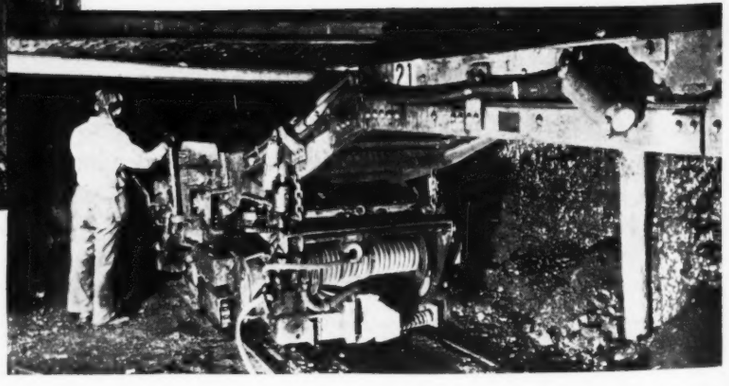
SAFELY with . . .
MORE TONS
per man . . .
LOWER COST
per ton . . .





IN THE
CONNELSVILLE DISTRICT

- MAXIMUM PRODUCTION
- EASE OF OPERATION
- SAFETY OF MEN
- LOW POWER NEEDS
- LOW MAINTENANCE



MYERS-WHALEY CO., INC.

KNOXVILLE, TENNESSEE *Since 1908*

. . . let **SUN MINE LUBRICANTS** help step up production all along the line

"Production and economy minded" operators in the outstanding coal fields are specifying SUN Mine Lubricants from "seam to chute" to help:

- **REDUCE POWER DRAG**
- **CUT MAINTENANCE**
- **STEP-UP EFFICIENCY**
- **LOWER LUBRICATION COSTS**

From top to bottom . . . 100% in every mine . . . a large operator has used SUN Mine Lubricants for several years. And rolled-up savings as much as 20% in mine car lubrication alone . . . to say nothing of savings in other operations.

If you're interested in meeting increased production demands; in rolling-up savings year after year — call in a SUN Lubricant Engineer. Place his valuable experience at your disposal by writing today.

SUN OIL COMPANY, Philadelphia

SUN OILS

PETROLEUM PRODUCTS FOR ALL INDUSTRIES

RUBBER, RESEARCH and ROT-RESISTANT FABRICS make "Ventube"* amazingly durable

THE FINEST extra-heavy, long-fibered yarns are selected and woven to specific standards set up by du Pont testing laboratories, and shipped to Fairfield, Conn., for the making of "Ventube." Every thread that goes into these fabrics is chemically treated to prevent fungus growths. And the most resilient natural rubber our laboratories have been able to find is imported from world markets especially for the compounds used in both coating and impregnating these fabrics with a rubber composition that won't peel off.

In addition to the extreme care taken in the selection of materials for the product, du Pont technicians are constantly on the lookout for ways and means of making "Ventube" better. Already, through research, we've added months to the life of the tubing. Developed a duct that's resistant to acid water, gases, fungus and rot. Made a tubing that gives long, efficient service under severest mining conditions.

We're confident "Ventube" can give you the service you want—*at lowest cost!* We'll be glad to submit estimates on jobs you're figuring or have a field representative visit your mine and recommend the type of tubing that meets your specific problem to best advantage. Feel free to write.

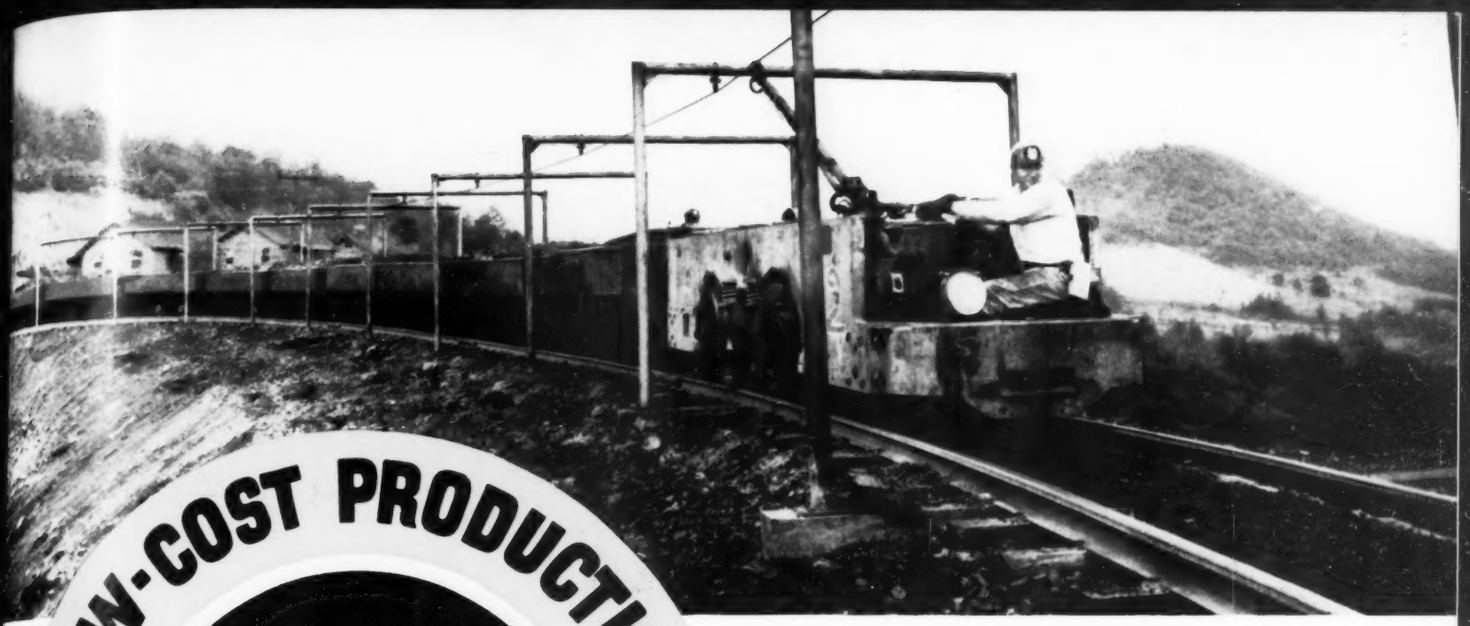
DU PONT ALSO MAKES a complete line of powder bags from the same sturdy material as is "Ventube." These bags are compact but roomy—and available in several serviceable sizes. Write du Pont for complete information.

"Ventube" is du Pont's registered trademark for its flexible rubberized ventilating duct.

E. I. DU PONT DE NEMOURS & COMPANY (Inc.)
"Fabrikoid" Division Fairfield, Connecticut

THE FLEXIBLE VENTILATING DUCT

DU PONT
REG U.S. PAT OFF
VENTUBE
REG U.S. PAT OFF

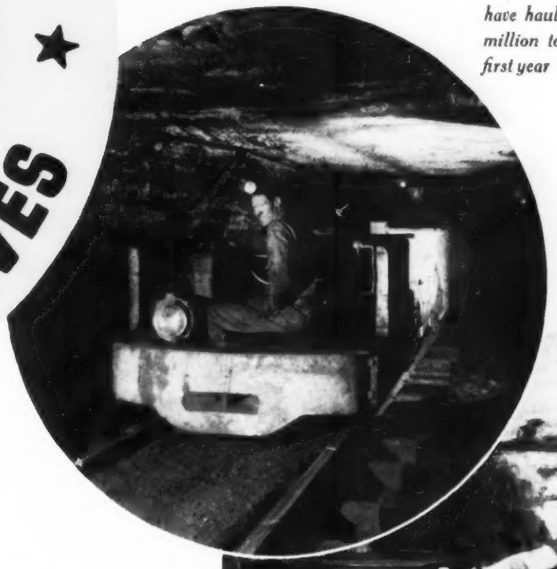


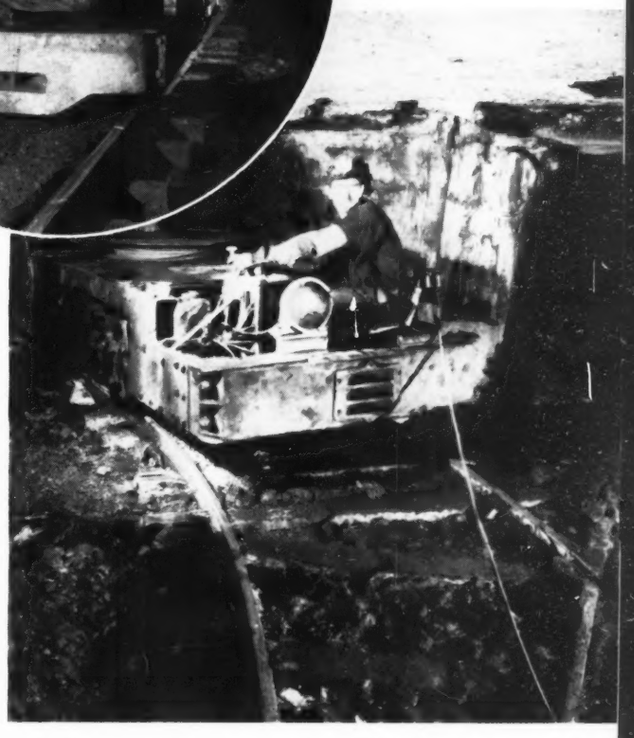
LOW-COST PRODUCTION

You find them together in Northern West Virginia

G-E MINE LOCOMOTIVES

Here are two new G-E 15-ton trolley locomotives equipped with dynamic brakes for main-line haulage at Robinson Run No. 2 Mine, Christopher Mining Company. The haul from underground in the mine to tipple dumping station is 8500 feet. These locomotives do 185 miles a day, operate three shifts a day, five days a week, have hauled approximately a million tons of coal in their first year





G-E 6-ton cable-reel locomotive in gathering service behind mechanical loader in Pursglove No. 15 mine of the Pursglove Coal Mining Company

We Offer You EXPERIENCE UNEQUALLED ANYWHERE

IN specifying G-E mine locomotives you benefit from our experience gained in building more than 10,000 mine locomotives. Yes, and also more than 1700 G-E electric locomotives for railways and industrial plants. They're all built on the same assembly floor.

That's why we're so well prepared to deal with mine-haulage problems of any kind—the problem, for example, of operation in unusually low veins. Six 8-ton G-E locomotives, only 26 inches high, were built for one West Virginia operator recently.

Out of this experience have come the many features of G-E mine locomotives that contribute to long life and low maintenance. Just a few of them: sturdy rolled-steel side frames joined to heavy welded end plates; equalized journal-spring suspension that distributes the weight equally on the wheels at all times; husky, heavy-duty motors that are more than a match for the tough jobs they have to do.

Whether you want standard-type mine locomotives or types to meet special conditions, let experienced G-E men design and build them for you. General Electric, Schenectady, New York.

GENERAL ELECTRIC

LOW-COST PRODUCTION

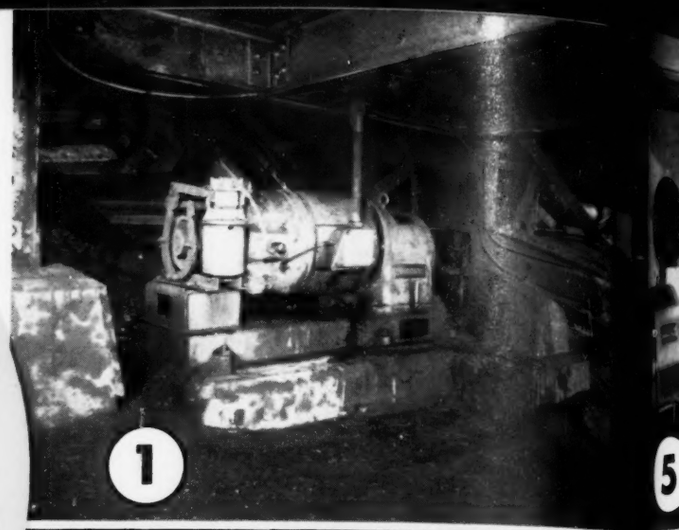
You find them together in Northern West Virginia

G-E MOTORS AND CONTROL

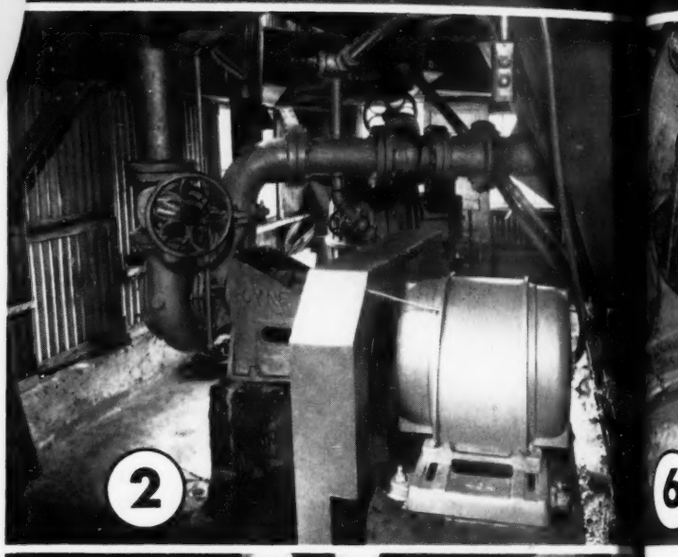
CONTINUOUS OPERATION AT EVERY POINT WITH G-E MOTORS AND CONTROL

YOU'LL find this G-E equipment everywhere—used underground and in preparation plants. On all kinds of jobs, too, because the complete G-E lines enable mining men to meet any drive requirement they may have.

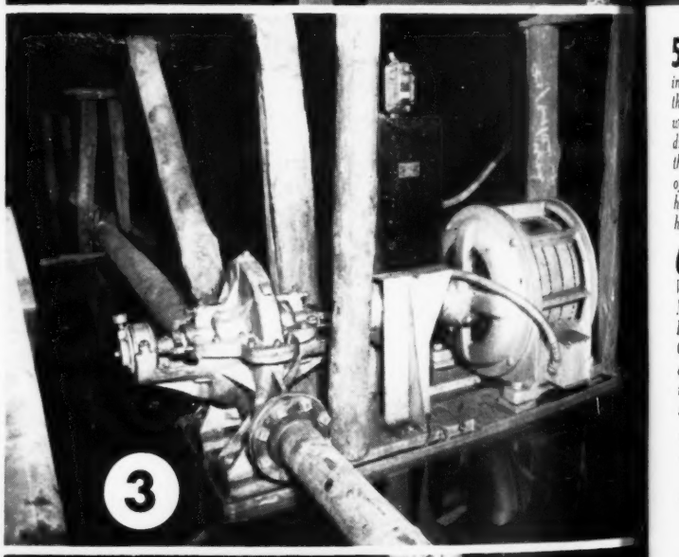
Here are pictures of typical installations—a few of the many G-E motor and control equipments in this territory that are helping in low-cost production by their ability to give years of continuous service. Reports from the field indicate that low maintenance is the rule, that long-time service with no repair costs at all is common.



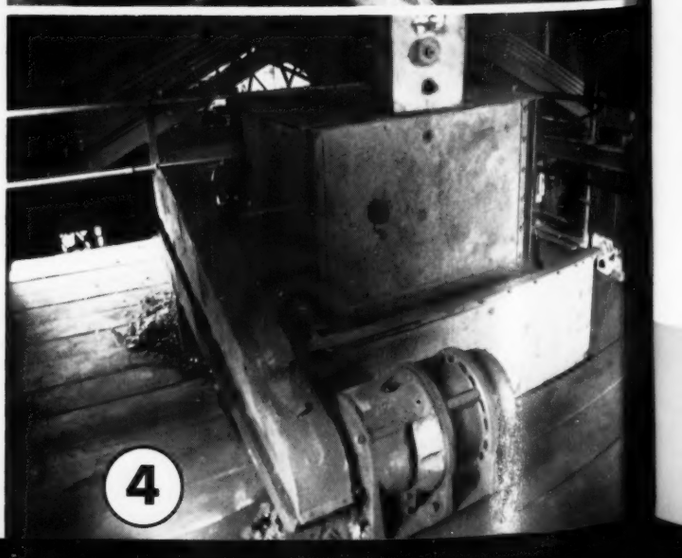
1 *A G-E TOTALLY ENCLOSED, FAN-COOLED MOTOR drives the 600-foot belt conveyor handling crushed coal at Robinson Run No. 2 Mine of the Christopher Mining Company. This type of motor has the extra protection necessary for operation in unusually dusty or wet locations. Note the G-E Thrustor-operated brake*



2 *A G-E 20-HP SPLASHPROOF MOTOR drives a sand pump in the Pursglove No. 15 cleaning plant of the Pursglove Coal Mining Company. This type of motor is recommended for locations where there is splashing or dripping water. Note G-E push-button station*

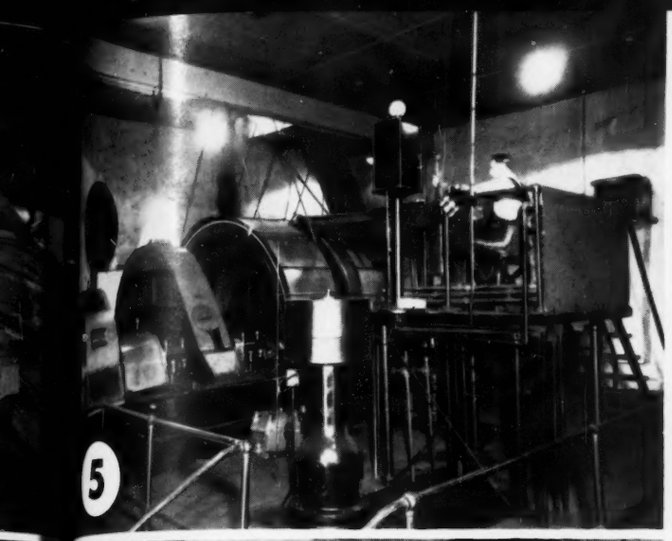


3 *This G-E 50-HP OPEN INDUCTION MOTOR using G-E control drives a mine-drainage pump in the Pursglove No. 15 Mine of the Pursglove Mining Company. G-E standard motors meet all kinds of drive requirements in coal mines and preparation plants. Iron frames and endshields and an insulation resistant to moisture and weak acids make them highly dependable even in underground locations*

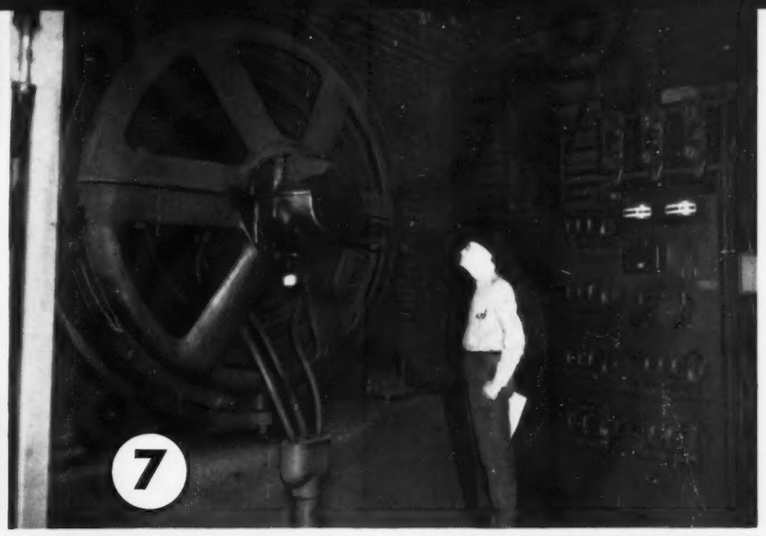


4 *This G-E 10-HP GEAR-MOTOR drives a belt conveyor in tipple at Mine No. 8 of the Jamison Coal & Coke Company. G-E gear-motors save space, are highly efficient low-speed drives. The planetary type of transmission makes possible balanced gear-tooth pressure, consequently longer gear life*

Remember G-E motor and control dependability when you make plans for modernizing or mechanizing your mine. You need only get in touch with our nearest representative or SPECIFY GENERAL ELECTRIC in your equipment order. General Electric, Schenectady, N. Y.

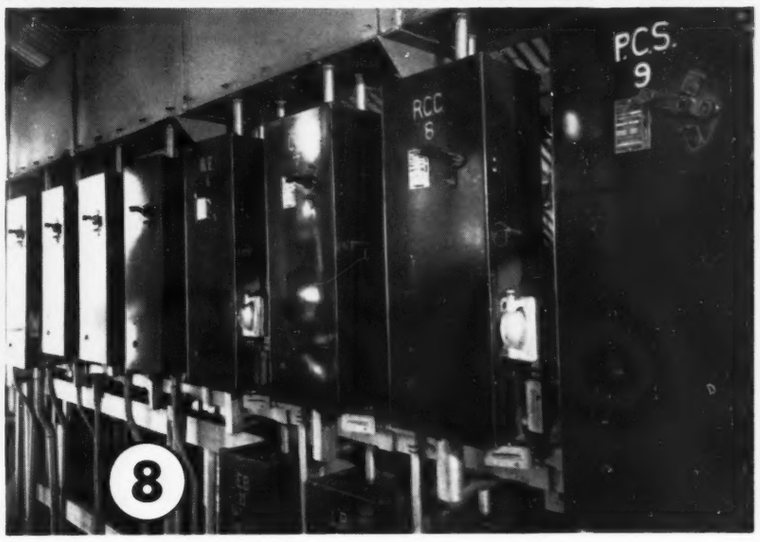


5 *G-E HOIST MOTORS play an important part in getting the coal out of the ground. Here's the G-E 900-hp, wound-rotor motor that drives the double-drum shaft hoist at Federal No. 1 Mine of the Koppers Coal Company. Over a period of 45 years about 360,000 hp of G-E hoist motors, equipped with G-E control, have been put in service*



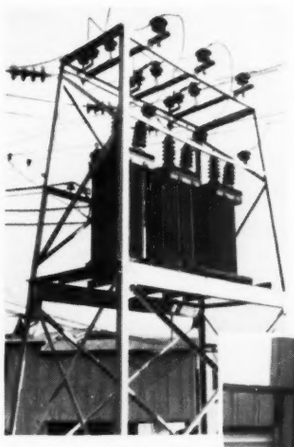
7 *G-E MOTORS FOR MINE-VENTILATING FANS are noted for efficient, economical operation. This G-E 300-hp wound-rotor motor drives a fan at Federal No. 1 Mine of the Koppers Coal Company. Provision has been made for adjustable-speed operation by means of the G-E control shown at the right*

6 *A G-E 150-HP, 575-RPM WOUND-ROTOR (SLIP-RING) MOTOR drives the slope hoist at the Bunker Mine of the Davis-Wilson Coal Company. Wound-rotor motors have adjustable-varying-speed and high-starting-torque characteristics. They bring smoothness and flexibility to operations*

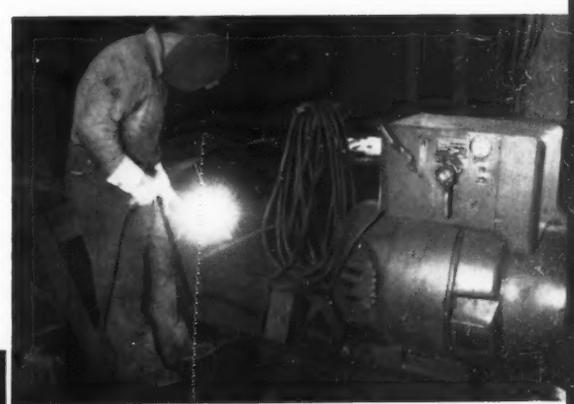


8 *G-E CONTROL starts, stops, and protects the motors in many Northern West Virginia mines—in the G-E equipped preparation plant at Pursglove No. 15 Mine of the Pursglove Coal Mining Company, for example, as you see here. When extra protection against dust and moisture is required, G-E control can be furnished in dust-tight and weatherproof cases*

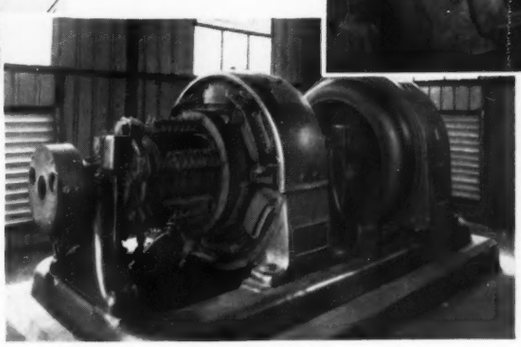
THESE . . . AND OTHER . . . TYPES OF G-E EQUIPMENT ALSO HELP ASSURE LOW-COST PRODUCTION



G-E TRANSFORMERS provide efficient, dependable stepping down of voltage at numerous mines and tipples in this territory. Here's a bank of three G-E 75-kw transformers at the Dawson Coal Company's mine and tipple



G-E ARC-WELDERS bring the advantages of flawless performance over the entire welding range to such important jobs as bonding rails, building up locomotive wheels, and many other types of repair work. Here is a G-E 250-amp, Type WD, portable, d-c arc welder in the repair shop at the Rosedale Mine, Rosedale Coal Company



G-E SUBSTATION EQUIPMENT is widely used to supply d-c power. This G-E 200-kw motor-generator set—completely automatic in operation—is one of several which have been in service at the mine of the Continental Coal Company for years. Maintenance expense has been practically negligible

GENERAL ELECTRIC

*Shortwall cutting machine — **and tellurium cable** — in the Bunker Mine of the Davis-Wilson Coal Company*

LOW-COST PRODUCTION

You find them together in Northern West Virginia

TELLURIUM CABLE

IT'S TELLURIUM—

—EXCLUSIVELY—AT MANY MODEL MINES

*Loading machine—**and tellurium cable**—in the Rachel Mine of Jones Collieries, Inc.*

WE find numerous low-cost producers in Northern West Virginia using tellurium portable cable exclusively in their mining operations.

What's the connection between low-cost production and the extensive use of this G-E cable? Perhaps it's the fact that tellurium is tough, has long life, is hard to cut, and withstands banging around, thereby saving on repairs and replacements and reducing costly holdups.

If that's the case, tellurium's wide application on cutters, loaders, drills, motors, and locomotives can mean substantial savings in the cost per ton of coal mined.

Next time *you* need some portable cable, why not *call for tellurium?* Your jobber can supply most sizes from stock. Or a G-E cable specialist will be glad to help you so that you can be extra sure of getting the right type and size. Address the nearest G-E sales office or General Electric, Dept. 6–201, Schenectady, N. Y.

*Portable electric coal drill—**and tellurium cable**—in Bunker Mine of Davis-Wilson Coal Co.*

*Cutting and shearing machine—**and tellurium cable**—in Maiden Mine of Kelley's Creek Colliery Company*

GENERAL ELECTRIC INSULATED CABLE

THE RIGHT TYPE FOR EACH JOB

GENERAL ELECTRIC

011-565

MISTER, IT'S YOUR MOVE FOR LOWER HAULAGE COSTS

Yes sir, it's your move if you want to cut the cost of hauling from mine to tipple. And what operator doesn't?

WALTER TRACTOR TRUCKS are helping strip mine operators reduce costs by hauling bigger loads, faster, with less lost time. The superior performance of Walter Four-Point Positive Drive is entirely due to the fact that Walter Motor Truck Company devotes its facilities to the production of four-wheel drive heavy duty trucks *only*. We do not divide our efforts by manufacturing any other type of truck. And it is further true that we have specialized in four-wheel drive ever since the first Walter Truck was built.

Ask us about Walter Automatic Lock Differentials . . . Suspended Double Reduction Drive . . . Ten-to-One Range Transmission . . . Exceptionally Powerful Heavy Duty Braking System, and other distinctive Walter features.

Mister, it's your move NOW.

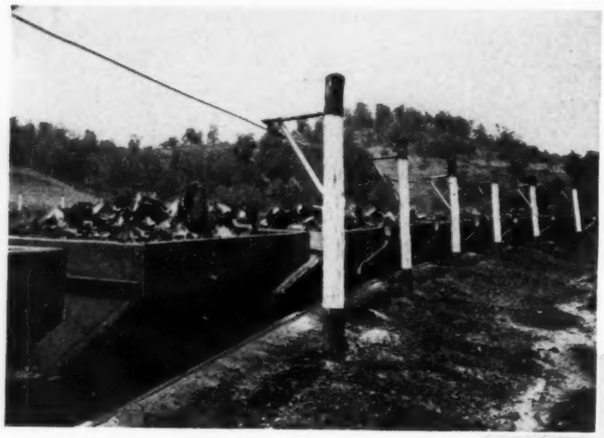
WALTER MOTOR TRUCK COMPANY

1001-19 IRVING AVENUE, RIDGEWOOD, QUEENS, L. I., N. Y.

Every second counts...

IN WEST VIRGINIA MINES!

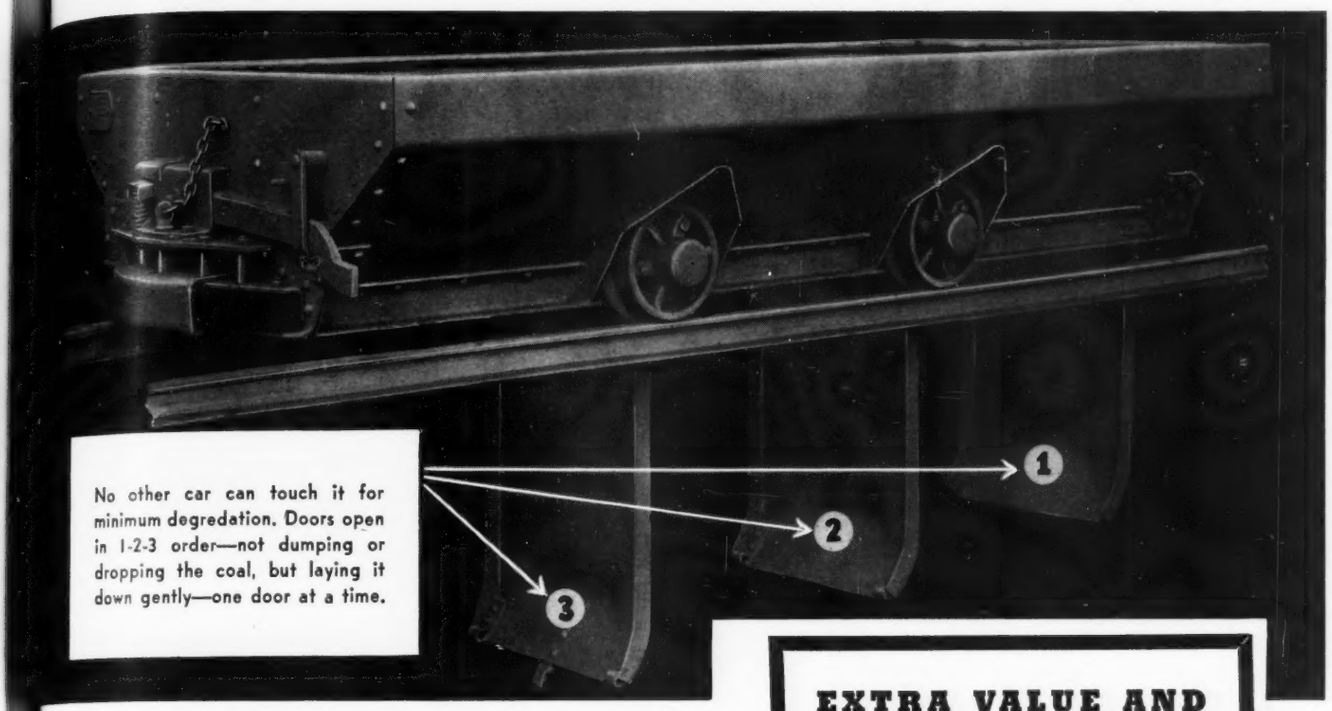
Faster haulage means increased production. That's why many of the largest producing mines in District No. 3 use S-D "Automatics" exclusively



West Virginia operators realize wasted time is wasted money. Every day more mines are speeding up production by installing time and labor-saving S-D "Automatics". Take a tip from these large operators and see for yourself how S-D "Automatics" will cut costs and increase output in your own mine. Don't pass up the money making advantages of S-D "Automatics" any longer. If you are not ready now to buy them, investigate our liberal rental plan. Your savings will more than pay the rentals.

At Eagle Mine of Getty Coal Company, Hepzibah, West Virginia, 125 Sanford-Day automatic bottom discharge cars hold production up to the maximum. These cars are equipped with S-D "Floater" Ball Bearing wheels . . . wheels that really save on power cost, lubrication cost and maintenance cost. This mine was reopened in 1932, and mechanical loaders placed in service in 1936. Production is on an average of 1,800 tons of coal a day.

At Christopher Mining Company, Robinson Run Mine No. 2, Maidsville, West Virginia, 122 Sanford-Day "Automatic" bottom discharge cars are in use, serving this new mine which started production July 16, 1938. Production is approximately 5,500 tons of coal a day, running 24 hours. This mine is 100 per cent mechanized, and S-D "Automatics", equipped with S-D "Floater" Ball Bearing wheels, are living up to their reputation of high production and low maintenance.


No other car can touch it for minimum degredation. Doors open in 1-2-3 order—not dumping or dropping the coal, but laying it down gently—one door at a time.
1
2
3

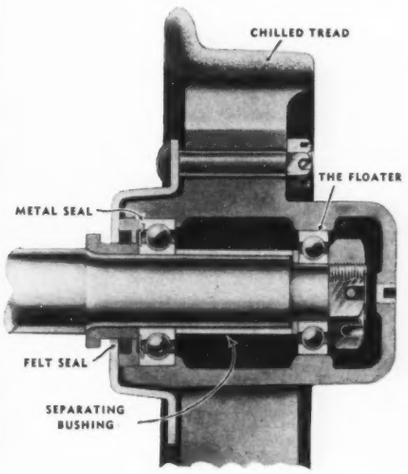
ONLY S-D 1-2-3 AUTOMATIC CARS HAVE SO MANY EXCLUSIVE TIME AND LABOR-SAVING FEATURES

Records of leading operators show that the many exclusive features of S-D "Automatics" are constantly cutting production time and costs. S-D "Automatics" pass over the tipple at the rate of 20 or more a minute, each car automatically discharging its load after passing a simple door tripping device. No expensive dumping equipment required. S-D "Automatics" gently lay the coal down and level it off, thus reducing breakage of coal to the minimum—a real money-making item in itself.

MAINTENANCE COSTS CUT TO A FRACTION!

Important in the operation of S-D "Automatics" is the reduction of car strain and wear. S-D "Automatics" lead an easy existence because they are not subjected to the strains incident to being lifted or turned over for dumping—another money making item in maintenance savings.

EXTRA VALUE AND SAVINGS IN THE S-D "FLOATER" BALL BEARING WHEELS



1 Deep chilled treads . . . true shape . . . with Sanford-Day's Patented annealing process.

2 The S-D "Floater" Bearing . . . permits automatic adjustment of bearings. No chance of pinching.

3 Demountable, like automobile wheels. By removing lock nuts, wheel may be slipped off axle, while bearings remain in place in perfect adjustment.

4 Solid closed hub . . . no loose caps . . . no projecting axles . . . no grease leakage.

SANFORD-DAY IRON WORKS, Inc., Knoxville, Tenn., U. S. A.

MINE CARS, ALL TYPES — TRAILERS — WHEELS — SHEAVES

LOW COST PRODUCTION

BEGINS HERE with ---

Koppers Coal Co., Federal No. 1 Mine electrical repair shop. Rewiring a Goodman cutter on the left and Jeffrey locomotive motors on the right with Rockbestos.

Continental Mine. One of twelve Rockbestos-wired Jeffrey cutters.

To the left a Jeffrey loader in the Arkwright Coal Co., Mona Mine. To the right a 15-ton Jeffrey locomotive in operation at the Getty Coal Co., Eagle Mine. Both wired with Rockbestos.

Rockbestos A.V.C.

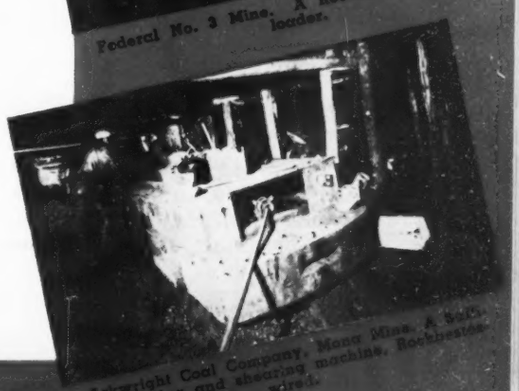
THE ORIGINAL

A.V.C. MINING CABLE

One of the Emily Mine's 10-ton locomotives wired with Rockbestos.

Federal No. 3 Mine. Two 15-ton Rockbestos-wired Goodman locomotives like this and a 20-ton, used for main haulage.

Federal No. 3 Mine. A Rockbestos-wired Joy loader.



Arkwright Coal Company, Mann Mine. A Sullivan cutting and shearing machine, Rockbestos-wired.

If you made a tour of the coal mines in Northern West Virginia, you'd realize that low cost production begins in the electrical repair shops of the mines which have standardized on Rockbestos A.V.C. Mining Cable for rewiring.

Here's why. When you put Rockbestos A.V.C. into mining equipment you're doing much more than replacing burnt out, current-leaking cable . . . you're putting in the one thing that effectively reduces the cost of equipment operation, and that is . . . *the ability to keep running indefinitely under severe conditions.* The most modern mining machinery won't make any money for you if it's *standing in the shop.* It saves money and cuts costs only while it's *running at the face.* Rockbestos A.V.C. was designed 12 years ago to keep mining equipment running . . . and it has been doing it ever since in more mines every year.

Here's how. Rockbestos A.V.C. has a *permanent* asbestos insulation. It is *heatproof, fireproof, vibration-proof* and *moisture-proof.* Overload heating won't break it down because the insulation never gets hard or stiff, and it doesn't crack open. It won't burn even under an arc, and it can swim in oil or grease without blooming, flowing, rotting or swelling.

That's why Rockbestos A.V.C. keeps equipment running and cuts production costs. Ask the men who use it! And if you want literature or samples write us or ask your jobber. Rockbestos Products Corporation, P. O. Drawer 1102, New Haven, Conn.

Also refer to McGraw-Hill Coal Mining Catalog

Order *from these jobbers — Specify* "ROCKBESTOS A.V.C."

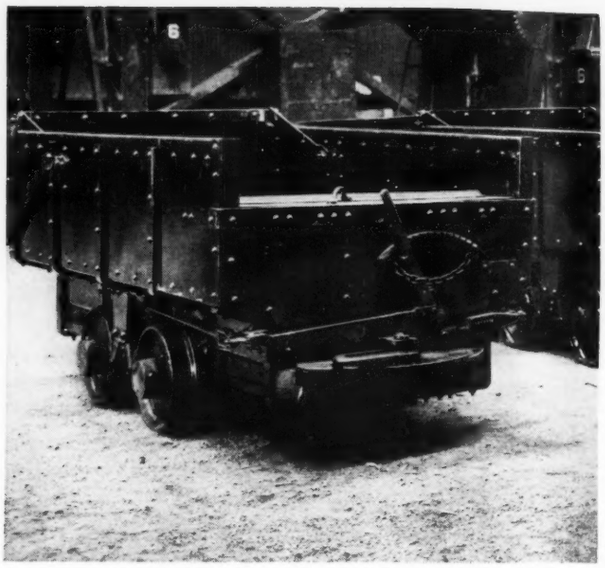
BECKLEY, W. VA.:	Beckley Mach. & Elec. Co.	FAIRMONT, W. VA.:	Fairmont Supply Co.
BIRMINGHAM, ALA.:	Moore-Handley Hdwe. Co.	HUNTINGTON, W. VA.:	Banks-Miller Supply Co.
BLUEFIELD, W. VA.:	National Elec. Coil Co.	LOTHAIR, KY.	Mine Service Co.
	Superior-Sterling Co.	MIDDLESBORO, KY.:	Rogan & Rogan Co.
CLEVELAND, OHIO:	Upson-Walton Co.	PITTSBURGH, PA.:	Upson-Walton Co.
COLUMBUS, OHIO:	National Elec. Coil Co.		Iron City Elec. Co.
EVANSVILLE, IND.:	Evansville Elec. & Mfg. Co.	SCRANTON, PA.:	Penn Elec. Engineering Co.

WILLIAMSON, W. VA.: Williamson Supply Co.

MAYARI R

PRONOUNCED MY'A-REE

Reduces dead weight in mine car construction



Mayari R is a high-strength, low-alloy steel that permits definite and sizable reductions in dead weight

HIGH YIELD POINT

With Mayari R's yield point of 50,000 p.s.i. min. (about twice that of mild carbon steel), designers can cut dead weights up to 50 per cent, depending on design and application.

MAYARI R IS A PRACTICAL STEEL

Reducing weight on a practical basis calls for an unusual combination of properties in the steel. Mayari R has these properties:

Workability: Mayari R can be worked like mild carbon steel, by the usual shop methods and the regular staff, with only minor allowances for its greater strength.

Weldability: All the usual gas and electric methods can be used with Mayari R. Neither the weld nor the adjacent metal air hardens, so that heat treatment is not required.

Corrosion Resistance: The life of Mayari R is indicated as five to six times that of mild carbon steel. This important feature protects the life of the thinner members made possible by Mayari's greater strength.

Impact and Abrasion Resistance: Mayari R has considerably better resistance to shock or impact than mild carbon steels at either normal or subzero temperatures and has excellent abrasion resistance.

Not Air Hardening: Mayari R does not air harden in rapid cooling; consequently, formed sections do not require heat treatment after forming.

Usable "As Received": Mayari R has the desired strength and ductility as it comes from the mill and is used without heat treatment.

Available in Usual Forms: All the usual products—sheets, strip, structural shapes, plates, bars and cold formed sections—are available in Mayari R. Designers can secure unity in design with increased economy by utilizing the various forms.

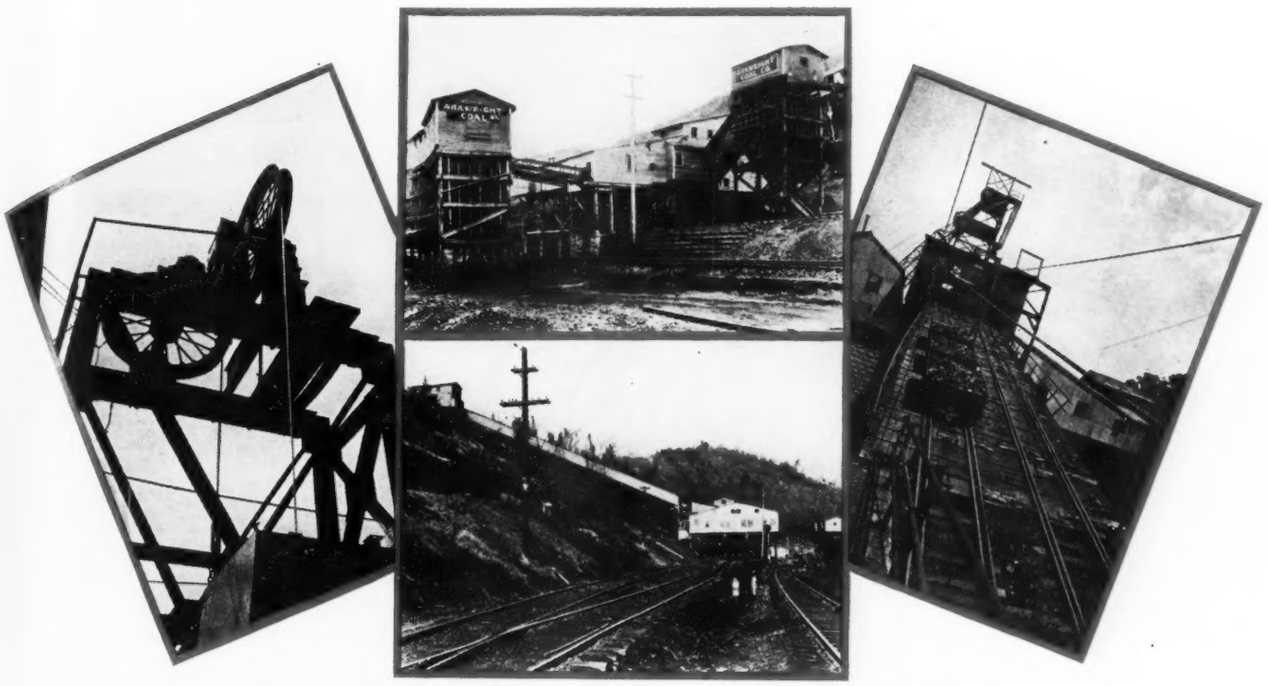
Low Costs: The appreciable saving in weight with Mayari R renders the finished-job cost practically equal to that of ordinary steel.

CATALOG ON REQUEST

A catalog describing Mayari R will be sent on request. We will also be glad to confer with you in order that you may obtain the greatest usefulness with Mayari R.

BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL



The above illustrations show three different kinds of equipment on which "HERCULES" (Red-Strand) Wire Rope is being used in Northern West Virginia—shaft hoist, button conveyor and slope hoist.

In Northern West Virginia—As Elsewhere,

"Hercules" (Red-Strand) Wire Rope

Is Instrumental In Providing Low Cost Production

Cost of production depends largely upon the efficiency of the equipment used. The real test of efficiency is on the job, and there is where "HERCULES" (Red-Strand) Wire Rope has proved, and is continuing to prove, its ability to provide low cost production. Its consistent performance is never a matter of chance, but the result of long experience, diligent research, and modern manufacturing facilities.

In order to be suitable for all purposes, "HERCULES" Wire Rope is furnished in a wide range of both Round Strand and Flattened Strand constructions—all of which are available in either the Standard or Preformed type. If you will tell us how you use wire rope, we shall be glad to suggest the construction and type we consider best for your particular conditions. Why not do this? It pays to use the best.

Made of Acid Open-Hearth Steel Wire

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WIRE ROPE MAKERS — ESTABLISHED 1857

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There are extra profits and fewer hazards in the use of Primacord for stripping coal. This strong, flexible, light-weight detonating fuse saves time in loading and connecting holes. Without the use of blasting caps, it makes every cartridge in the hole go with the force of a primer cartridge. It develops better fragmentation, makes removal easier, and increases the profitable output.

Valuable information on the use of this powerful, insensitive detonating fuse is contained in the Primacord Booklet — free on request.

THE ENSIGN-BICKFORD COMPANY
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